

## Blockchains, Orphan Works, and the Public Domain

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### ABSTRACT

*This Article outlines a blockchain based system to solve the orphan works problem. Orphan works are works still ostensibly protected by copyright for which an author cannot be found. Orphan works represent a significant problem for the efficient dissemination of knowledge, since users cannot license the works, and as a result may choose not to use them. Our proposal uses a blockchain to register attempts to find the authors of orphan works, and otherwise to facilitate use of those works.*

*There are three elements to our proposal. First, we propose a number of mechanisms, included automated systems, to perform a diligent search for a rights holder. Second, we propose a blockchain register where every search for a work's owner can be recorded. Third, we propose a legal mechanism that delivers works into orphanhood, and affords a right to use those works after a search for a rights holder is deemed diligent. These changes would provide any user of an orphan work with an assurance that they were acting legally as long as they had consulted the register and/or performed a diligent search for the work's owner.*

*The Article demonstrates a range of complementary legal and technological architectures that, in various formations, can be deployed to address the orphan works problem. We show that these technological systems are useful for enhancement of the public domain more generally, through the existence of a growing registry of gray status works and clarified conditions for their use. The selection and design of any particular implementation is a choice for policy makers and technologists. Rather than specify how that choice should look, the goal here is*

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*to demonstrate the utility of the technology and to clarify and promote its role in reforming this vexed area of law.*

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## INTRODUCTION

Orphan works are works which are still ostensibly protected by copyright, but for which a rightsholder cannot be found. They represent a significant problem for the efficient dissemination of knowledge, since potential users of the works cannot license their use, and as a result may choose not to use them for fear of a possible infringement action if the owner does subsequently emerge. This has the potential to ‘lock up’ cultural material on one hand, while encouraging wide-spread infringement on the other. Orphan works also represent a challenge to the legitimacy of the copyright system as a whole, since any property system where a large percentage of owners cannot be found is almost certainly broken.

This Article outlines a blockchain based registry system to remedy the orphan works problem.<sup>1</sup> Although a mandatory register of copyright owners is an

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1. See *infra* Section I.A et seq. As a matter of nomenclature, the term “blockchain” can be used to refer to the “blockchain protocol,” that is, the technical architecture/description that can be used to

impossible and illegal proposition, our proposal uses a blockchain to create a register of attempts to search for copyright owners. The blockchain is the technical protocol at the heart of Bitcoin, a cryptocurrency that has recently spurred examinations of how we might revolutionize the legal system across regimes as wide-ranging as real property and deed registration, property law in digital environments, share registries, privacy, banking and payments, commercial paper and secured transactions, and currency systems, amongst others.<sup>2</sup> The blockchain is a type of “distributed ledger”, a phrase which captures the essence of the technology. Simply put, the blockchain is a technical protocol to create a secure, transparent ledger that reports transactions to everyone within a given network.<sup>3</sup> Our proposal is to use the blockchain ledger—in conjunction with a small change to the copyright system and a simple implementation of artificial intelligence technology—to solve the orphan works problem.

There are three elements to the proposal. Because the Berne Convention and TRIPS agreements prohibit mandatory copyright formalities that might generate a registry of rights holders, most orphan works clearance mechanisms are anchored around a good-faith, diligent search for an owner. Unfortunately, a diligent search for a copyright holder is expensive, and search costs are sufficient to prevent many uses of orphan works, especially large-scale uses by cultural institutions.<sup>4</sup> The first component of our proposal is therefore an artificial intelligence system to perform a diligent search for a rights holder. There has already been some discussion, and experimental implementation of, diligent search systems in Europe. And while those deployments of automation are a substantial step towards making orphan works available, we argue that the process could be dramatically improved with one primary mechanism: a dynamic, immutable, auditable record of those searches.

The second component of our proposal is a blockchain register where every search for a work’s owner can be recorded. That register of searches has the potential to bring evidential significance to an automated system for diligent searches for use by anyone, rather than it being exclusively a tool of institutional risk management. Think of this as a ledger where every work that may be an orphan has a page, and on that page is recorded each attempt by a would-be-user of that work to find the owner. For each orphan work there may be zero, one, two, or a million searches recorded,

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create a distributed ledger, or to a particular instance of this architecture, such as the blockchain implementation that underlies Bitcoin. In this article we will generally refer to the blockchain protocol as “the blockchain” and any given instance as “a blockchain.” But where we don’t, the context will make the usage clear. In the context of this article, “Bitcoin” is used to refer to the currency generally, while “bitcoin” refers to a unit of the currency.

2. See, e.g., Josh Fairfield, *BitProperty*, 88 S. CAL. L. REV. 1 (2015); Primavera De Filippi, *The Interplay Between Decentralization and Privacy: The Case of Blockchain Technologies*, 7 J. PEER PROD. 1 (2016), available at <https://perma.cc/E5ZQ-WSGY>; GARETH W. PETERS & EFSTATHIOS PANAYI, *BANKING BEYOND BANKS AND MONEY* 240-76 (Paolo Tasca et al. ed., 2016).

3. Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, BITCOIN (Nov. 1, 2008), <https://perma.cc/4B6X-9ZUD>.

4. Anna Vuopala, *Assessment of the Orphan works issue and Costs for Rights Clearance*, EUROPEAN COMMISSION (May 2010), <https://perma.cc/U7TE-SW5S>.

and every time someone looks for the owner of the work the search is collected and recorded. To help in the conceptualization of this part of the proposal, it might be helpful just to think of this as a hardcopy book of searches that is controlled by a government or private agency, although the reality is more interesting.

The third component of our proposal is a legal mechanism that delivers works into orphanhood, and affords a right to use those works after a search for a rights holder is deemed “diligent.” Although a diligent search requirement for orphan works clearance is not in the U.S. copyright system, it is present in a limited way within European copyright systems and is in no way inconsistent with the international copyright system. The change proposed here would provide any user of an orphan work with an assurance that they were acting legally as long as they had performed a diligent search for the work’s owner. If the “diligence” of a search defines the orphan status of a work, the determination and verification of “diligence” become important tasks. Should we leave the assessment of diligence to the prospective user, the courts, or an administrative body? Alternatively, could it be defined by the technical architecture recording the nature and extent of searches for a rights holder?

The answer depends on the contours of the legal architecture selected to provide a use right on the basis of a diligent search. Different legal approaches leave the search and a verification of its diligence to different parties, and selecting the most desirable mechanism inevitably involves a trade-off between human oversight, the integrity of property rights, and legal certainty. For instance, a right to use an orphan work might be through limitation on liability after a judicial verification of a diligent search where the blockchain registry can be used as evidence. Alternatively, use of orphan works may be permitted by a statutorily mandated, nonexclusive, compulsory license, vested to a party when the search for owners achieved a technically determined “diligence” threshold. In such a case, the orphan works blockchain might take on the character of a real property registration system, where the right is vested by virtue of registration.<sup>5</sup>

To a certain degree, a sophisticated technical architecture could ameliorate the short-comings of each legal mechanism. However, a better approach would be to consider an appropriate legal architecture on the basis of what the technological architecture can achieve, meaning the technology should participate centrally in any legal reform. Accordingly, this Article explores several existing and proposed legal architectures for addressing orphan works, and evaluates how they might be augmented by, or even embedded into, the technical architecture we outline. Using a technological system, especially an automated one, to make legal decisions and define legal categories raises complex theoretical questions.<sup>6</sup> The blockchain and automation are reinvigorating discussions around the relationship between law,

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5. See, e.g., R.G. Patton, *The Torrens System of Land Title Registration*, 19 MINN. L. REV. 519 (1934).

6. See, e.g., Vaios Karavas & Gunther Teubner, *www.CompanyNameSux.com: The Horizontal Effect of Fundamental Rights on ‘Private Parties’ within Autonomous Internet Law*, 4 GERMAN L.J. 1335, 1335–58 (2008).

technology, and governance.<sup>7</sup> This is especially true for government processes that involve registration, and even more so where that registration produces significant legal consequences.

This Article proceeds as follows: Part I describes blockchain technology and its relevance for copyright. That Part also outlines the orphan works problem in more detail, exposing how and where blockchain technology could be useful. Part II outlines the technical formation that we suggest to drive a highly effective orphan works clearance system. This includes a description of the diligent search expert system, a blockchain register of searches, and the potential use of smart contracts as “smart licenses” to automate various licensing processes including escrow, payments and updating of copyright status. Part III describes various existing and proposed legal architectures for addressing orphan works, and how they might be complimented or adapted by the technology we propose. This includes a discussion of how legal consequences might be attributed to the technology, the significance of automating legal and governmental functions, and the compromises and risks this proposal entails.

The conclusion of our Article demonstrates a range of complementary legal and technological architectures that, in various formations, can be deployed to address the orphan works problem. We argue these technological systems are useful for general enhancement of the public domain through the existence of a growing registry of gray status works and clarified conditions for their use. The selection and design of any particular implementation is a choice for policy makers and technologists; the goal here is to demonstrate the utility of the technology and to clarify and promote its role in any potential law reform.

## I. BLOCKCHAINS AND ORPHAN WORKS

The first component of our proposal is a blockchain where every search for a work’s owner can be recorded. We explain the details of our proposed technical architecture below, but it is important first to understand the nature of the blockchain.<sup>8</sup>

### A. A TECHNICAL HISTORY OF BITCOIN AND BLOCKCHAINS

The blockchain is the underlying architecture of Bitcoin, the cryptocurrency that has been a focal point of financial journalism over the last four or five years. The idea of a digital money system independent of the state has been a shining talisman for a certain set of people called, variously, “cyberlibertarians”, “crypto-anarchists,”

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7. See, e.g., Riika Koulu, *Blockchains and Online Dispute Resolution: Smart Contracts as an Alternative to Enforcement*, 13 SCRIPTED 41 (2016); Aaron Wright & Primavera De Filippi, *Decentralised Blockchain Technology and the Rise of Lex Cryptographia* (Mar. 12, 2015) (unpublished manuscript) (on file with <https://perma.cc/H9AS-BDY7>); Melanie Swan, *Blockchains may replace the institutions that safeguard commercial activities*, LSE BUS REV. (2016), available at <https://perma.cc/PVJ4-L3NP>.

8. See *infra* Section I.B et seq.

or “nutjobs.” While Bitcoin has been cheerily discussed on NPR and NBC, it has politically radical roots. The blueprint for cryptocurrency was first floated in the early 1990’s in the techno-ideological ether of the Cypherpunks mailing list.<sup>9</sup> Cypherpunks generally endorse the premise that cryptography—the art and science of encrypting information—can be used to effect positive political and social change.<sup>10</sup>

Author and Intel engineer Tim May was one of the founders of the Cypherpunks mailing list. He used the list to promote “crypto-anarchy,” that is, the use of cryptography to facilitate private contractual ordering, promote individual liberty, and dismantle the nation-state. According to May, governments had and would continue to suppress popular cryptography. As he explained in the 1988 “Crypto Anarchist Manifesto”:

The State will of course try to slow or halt the spread of this technology, citing national security concerns, use of the technology by drug dealers and tax evaders, and fears of societal disintegration. Many of these concerns will be valid; crypto anarchy will allow national secrets to be trade [sic] freely and will allow illicit and stolen materials to be traded. An anonymous computerized market will even make possible abhorrent markets for assassinations and extortion. Various criminal and foreign elements will be active users of CryptoNet. But this will not halt the spread of crypto anarchy.<sup>11</sup>

May’s message struck home with a sizeable contingent of early “netizens” who were concerned—correctly, it turned out—that territorial governments would attempt to limit the freedoms on the new electronic frontier and turn it into a tool for surveillance. Resistance through encryption was seen as necessary to escape the looming threat of government power.<sup>12</sup>

On November 27, 1998, a person calling himself Wei Dai posted a message to Cypherpunk that primarily concerned a new protocol for network encryption.<sup>13</sup> But he also included a link to a short essay on his own website, which began: “I am fascinated by Tim May’s crypto-anarchy. Unlike the communities traditionally associated with the word ‘anarchy’, in a crypto-anarchy the government is not temporarily destroyed but permanently forbidden and permanently unnecessary.”<sup>14</sup>

9. The group indicates that its interests involve “remailers, anonymous peer-to-peer services, secure network tunnels, mobile voice encryption, untraceable electronic cash, secure operating environments, etc.” Lucky Green, *Trusted Computing Platform Alliances: The Mother(board) of all Big Brothers*, CYPHERPUNKS, <https://perma.cc/8T3A-PMLZ> (last visited Oct. 22, 2017). See generally Steven Levy, *CRYPTO* (2001) for a popular account of cypherpunk history and ideology.

10. See Timothy C. May, *True Nym and Crypto Anarchy* (1996), in *TRUE NAMES: AND THE OPENING OF THE CYBERSPACE FRONTIER* 33-86 (Vernor Vinge et al. eds., 1997).

11. Timothy C. May, *The Crypto Anarchist Manifesto*, SATOSHI NAKAMOTO INSTITUTE, <https://perma.cc/V3FW-57VE>.

12. Julian Assange was one notable participant in the Cypherpunks discussion.

13. The name Wei Dai is probably a pseudonym, and his public website contains no biographical information. WEI DAI, <https://perma.cc/R5ZJ-XX2Z> (last visited Oct. 22, 2017).

14. Wei Dai, *B-Money*, WEI DAI, <https://perma.cc/KWQ6-PA7X> (last visited Oct. 22, 2017). In fact, Wei Dai proposed two protocols: the first one he indicated was flawed, but the second he suggested as an implementable system.

Beginning from this philosophical position, Wei Dai furthered May's crypto-anarchic vision by sketching out a technology that would create an extra-governmental value exchange system, called "b-money." Despite the lack of government control, Wei Dai's b-money proposal would ensure that all transactions were verified by a decentralized network that would also hold an authoritative and permanent ledger. The ledger would not symbolize value held in some other form, but would actually constitute that value. Also, "new" b-money would be generated—essentially, minted—by the expenditure of computer processing power in pursuit of solving the encryption challenges required by the protocol.<sup>15</sup>

Ten years later, a person calling themselves Satoshi Nakamoto announced on several mailing lists that they had written a research paper implementing, with more specificity and detail, the core features of Wei Dai's b-money proposal. They called this implementation "Bitcoin," and posted it to the website [www.bitcoin.org](http://www.bitcoin.org), a domain created in August 2008. Their paper's first footnote cites Wei Dai's 1998 email message.<sup>16</sup>

Nakamoto was as mysterious as Wei Dai. Their original user profile indicated they lived in Japan, yet their email address was from a German free email provider.<sup>17</sup> Despite many attempts to unmask Nakamoto, it seems that their true identity will remain a mystery.<sup>18</sup> Whoever they are, Nakamoto mined the first "genesis block" of bitcoins in January 2009, as well as a substantial number of early bitcoins, making them a potential billionaire at recent exchange valuations.<sup>19</sup> Satoshi Nakamoto's mystery and power has made them legendary within the Bitcoin community, a kind of crypto-libertarian mashup of Spartacus, Keyser Söze, and Jay Gatsby.

For some years, there was a flurry of interest in Bitcoin, including exhaustive media stories, government and regulatory whitepapers, and academic articles in finance, economics, sociology, and law. For the most part, these discussions focused on the challenge that cryptocurrencies like Bitcoin present to national sovereignty, currency control, and tax policy. But around 2015, policy makers, economists, and legal academics began to notice that the blockchain—the distributed, transparent, and secure ledger that underlies Bitcoin—was, perhaps, a more interesting subject of study.<sup>20</sup> The blockchain protocol can re-architect registry systems and provide for "trustless trust," that is, guaranteeing the integrity of digital transactions without

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15. See Wei Dai, *supra* note 14; Wei Dai, BITCOINWIKI, <https://perma.cc/NLE2-YM3Q> (last visited Oct. 22, 2017); Wei Dai, THE BOOK OF BITCOIN, <https://perma.cc/A935-B8RF> (last visited Oct. 22, 2017).

16. See Nakamoto, *supra* note 3.

17. *Id.*

18. Andrew O'Hagan, *The Satoshi Affair*, 38 LON. R. BK 7 (2016); Chris Benjamin Wallace, *The Rise and Fall of Bitcoin*, WIRED (Nov. 23, 2011, 2:52 PM), <https://perma.cc/UAG6-2T5M> (suggesting that Nakamoto might be a team at Google, or at the National Security Agency, or at a financial institution). For more theories, see *Who is Satoshi Nakamoto?*, COINDESK, <https://perma.cc/XF9F-XHVV> (last visited Oct. 22, 2017).

19. Alec Liu, *Bitcoin Mints Its First Billionaire: Its Inventor, Satoshi Nakamoto*, MOTHERBOARD (Nov. 30, 2013, 9:28 AM), <https://perma.cc/FDA4-JKV3>.

20. Mark Staples, *Blockchain is Useful for a Lot More than Just Bitcoin*, THE CONVERSATION (May 10, 2016, 4:04 PM), <https://perma.cc/9H7H-UZMQ>.

trusted intermediaries like governments or banks.<sup>21</sup> Once this had been observed, the relationship between Bitcoin and the blockchain shifted: Bitcoin came to be seen as an interesting—possibly trivial—use of the transformatively disruptive blockchain technology.

Why is the blockchain protocol transformative? And how? In short, the blockchain provides a way of guaranteeing that a record existed at a certain time. It doesn't matter what that record is—it can be a file, a piece of music, a transaction, a piece of digital art, an email—as long as it can be coded in data then coded onto, and retrieved from, a blockchain. Further, the validity of this record is guaranteed by its presence on the blockchain, and not reliant on a third party guarantor.

Blockchain's core technology is a public key cryptographic algorithm similar to the ones used to secure credit card transactions over the web, or to secure text messages sent via Telegram or WhatsApp. To add a record to a blockchain, a record is first run through the algorithm to create a unique, encrypted string of data called a "hash." This hash uniquely identifies the record, and guarantees its integrity, because there is no way that anyone can alter the hash without corrupting it. Once a record has been "hashed," it is then gathered together with a small number of other hashes of other records that were encrypted around the same time. This collection of hashes is called a "block." The first block created in any blockchain serves as a "genesis block"; each time a new block is created, it is linked to the last block, thereby creating a cryptographically-connected chain of blocks. This is why the protocol is called the "blockchain": it is a chain of blocks of hashes, which cryptographically encodes every single transaction that has occurred within that blockchain. An example might make this clearer. Bitcoin, the best-known blockchain implementation, is a series of public records that begins with the first transfer of bitcoins to the first account holder. Many records have subsequently been added to the Bitcoin blockchain, some involving the creation of new bitcoins and others recording the transfer of bitcoins from one account holder to the other.<sup>22</sup>

At its heart, then, the blockchain is simply a ledger of transactions, much like an electronic version of a handwritten bank ledger. But the blockchain ledger is unusual and profound in at least two ways. First, the blockchain records *all* of the transactions

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21. Kevin D. Werbach, *Trust, But Verify: Why the Blockchain Needs the Law*, BERKELY TECH. L.J. (forthcoming 2018) (on file with BERKELY TECH. L.J.) (quoting Reid Hoffman, *Why the Blockchain Matters*, WIRED (May 15, 2015), <https://perma.cc/TL95-RVJP>).

22. The Bitcoin blockchain has a particular technical wrinkle that is necessary for a currency system: the coins have to be brought into being through a process called "mining." Bitcoin miners (at least currently) receive new bitcoins in exchange for verifying new ledger entries, based on a process called "proof of work." *Proof of Work*, BITCOINWIKI, <https://perma.cc/7Q5U-VT9D> (last visited Oct. 22, 2017). To become a miner, one downloads the Bitcoin client software and competes to record new transactions; at the same time, one spends some portion of his or her computer's processing power to solve complex mathematical puzzles. De Filippi & Wright, *supra* note 7, at 7. Security of the system is guaranteed by ensuring that the processing power of the network is not concentrated in the hands of any one person or group: as long as no-one controls more than fifty percent of the blockchain network, the system is guaranteed to be secure. As Nakamoto put it: "The system is secure as long as honest nodes collectively control more CPU power than any cooperating group of attacker nodes." See Nakamoto, *supra* note 3, at 1.



that ever occurred within the network. The technology of the blockchain is such that one party cannot make any transaction without the transaction being duly recorded in the authoritative ledger. Transactions from *A* to *B* can be disguised by circuitous misdirection—*A* might give to *C*, *D*, and *E* (and thousands of others shell transactions) before the endpoint when the transaction ends with *B*. However, with patience, one can wade through the ledger and ascertain originating and receiving addresses. Like the Domesday Book of William the Conqueror, the blockchain ledger tells the complete story of the division of property interests. Unlike the Domesday Book, it is the perfect map.

The second feature of the blockchain ledger is that it is public and indiscriminate. It is possible to create both public and private blockchains, but the distinction here is somewhat misleading.<sup>23</sup> All blockchains are transparent to their members, and “private” blockchains are only private to the extent that not everyone is entitled to join that blockchain. Once you become a member of a public or private blockchain, you become privy to a complete copy of every transaction ever made on that blockchain.

The significance of such ledger features is profound. As the U.K. whitepaper on uses of blockchain in government notes, these technologies could “help governments to collect taxes, deliver benefits, issue passports, record land registries, assure the supply chain of goods and generally ensure the integrity of government records and services.”<sup>24</sup> Any system of laws that relies on an authoritative register is about to be transformed, and each week brings a new raft of announcements about the use of blockchains in title deed registration, securities issuing, digital identity, and other “governmental” functions.<sup>25</sup> We propose a similar possibility for copyright and orphan works.

## B. BLOCKCHAINS AND GOVERNANCE

The use of blockchain within copyright here goes beyond its use as “a cost efficient and secure way of storing assets of various types and in addition achieve a better interoperability due to the open, distributed, and global architecture.”<sup>26</sup> Rather, a copyright blockchain ledger precisely addresses the problems and

23. Public and private blockchains are sometimes termed “permissionless” and “permissioned,” respectively. Bitcoin and Ethereum are the best examples of public or permissionless blockchains, which any computer may join or leave at any time. Permissioned or private blockchains have generally been used for financial databases, and at the core of most implementations of legal registers. See PETERS & PANAYI, *supra* note 2, at 244.

24. GOVERNMENT OFFICE OF SCIENCE, *DISTRIBUTED LEDGER TECHNOLOGY: BEYOND BLOCK CHAIN* 6 (2016), available at <https://perma.cc/XYZ5-ZQSD>.

25. See Jonathan Keane, *Sweden Moves to Next Stage With Blockchain Land Registry*, COINDESK (Mar. 30, 2017), <https://perma.cc/CPE4-9L9Z>; Taketoshi Mori, *Financial Technology: Blockchain and Securities Settlement*, 8 J. SEC. OPERATIONS & CUSTODY 208 (2016); Laura Shin, *The Identity Solution*, FORBES (Jun. 22, 2017, 9:30 AM), <https://perma.cc/C2WL-PLUD>; William Mougayar, *The Blockchain is Perfect for Government Services*, COINDESK (Sep. 3, 2016), <https://perma.cc/TJ6H-ZE4X>.

26. Svein Ølnes, *Beyond Bitcoin: Enabling Smart Government Using Blockchain Technology*, in *ELECTRONIC GOVERNMENT* 253, 254 (Springer 2016).

inefficiencies associated within hierarchical, centralized organizational structures like state bureaucracies and firms (for instance, Copyright Management Organizations “CMOs”) that are ordinarily involved in orphan works rights clearance.<sup>27</sup> For example, prior exercises in compulsory licensing of orphan works have struggled with these inefficiencies to the point of making the administrative process unfeasible. The primary roadblock is the need for, and the expense associated with, the administrative agency verifying the adequacy and diligence of the applicants’ search effort. Producing a consensus around the necessary facts and conditions that would define orphanhood becomes impossible. Distributed ledgers precisely facilitate such consensus and coordination with less intermediation and greater efficiency, enabling different legal models and governance structures for orphan works use.

Distributed ledgers enable transaction platforms between government and citizen, government data sharing and analytics, and transparency in government business and administrative processes.<sup>28</sup> However, using distributed ledgers to administer governmental or quasi-governmental registries raises its own questions. Applications like Bitcoin require multiple installations for cryptographic integrity, without which “it would simply amount to an encrypted centralized system.”<sup>29</sup> Open ledgers are generally verified through incentive mechanisms, where “miners” incur processing costs in order to perform the cryptographic functions that keep the system operating. Without miners, the blockchain is, at heart, a private recording system maintained by whomsoever pays for the processing power. Without an economic incentive to perform that cryptographic work, as Saifedean Ammous argues, “[t]he security of the system rests on the security of the central party funding the miners.”<sup>30</sup> This raises questions as to whether blockchain technology is appropriate for government services that may not want to engage with fully decentralized architectures.

On the other hand, while Bitcoin-type blockchains that use miners and “proof of work” cryptography to incentivise the security of the system may be more mature, blockchain projects with alternative consensus mechanisms, like “proof-of-stake”, as well as other blockchain architectures, like the IBM-supported HyperLedger Fabric Project, may be better suited for government service applications.<sup>31</sup> These developments will likely expand the applicability of distributed ledgers beyond the

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27. See, e.g., Marcella Atzori, *Blockchain Technology and Decentralized Governance: Is the State Still Necessary?* (Dec. 1, 2015) (unpublished manuscript) (on file with <https://perma.cc/HVT9-M2FB>).

28. R.J. Krawiec & Jason Killmeyer, *Blockchain Technologies Could Transform Government Services*, *TECHCRUNCH* (Nov. 21, 2016), <https://perma.cc/5ZBQ-P76Z>.

29. Garry Gabison, *Policy Considerations for the Blockchain Technology Public and Private Applications*, *SMU SCIENCE & TECH. L. REV.* 327, 341 (2016).

30. Saifedean Ammous, *Blockchain Technology: What is it Good For?* (Aug. 8, 2016) (unpublished manuscript) (on file with <https://perma.cc/A9LH-6K34>).

31. DON TAPSCOTT & ALEX TAPSCOTT, *BLOCKCHAIN REVOLUTION: HOW THE TECHNOLOGY BEHIND BITCOIN IS CHANGING MONEY, BUSINESS, AND THE WORLD* 32 (2016); Hossein Kakavand et al., *The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies* (Jan. 1, 2017) (unpublished manuscript) (on file with <https://perma.cc/QE7E-6XUZ>).

scope of fungible assets such as money and property, and into other arenas, including non-exclusive copyright licenses.<sup>32</sup> Accordingly, despite being anathema to blockchain purists, “permissioned” closed blockchains (shared ledgers limited to trusted nodes) or even “sidechains” (which share the Bitcoin blockchain but use different addresses) may be more viable for services of general interest rather than services carrying clear financial incentives.<sup>33</sup> Such systems can be designed for specific purposes with bespoke consensus and verification systems and can demand different levels of control.<sup>34</sup>

Rather than simply providing a new technology for data and record management, distributed ledgers introduce institutional technologies that allow new means of coordinating economic activity.<sup>35</sup> As Davidson, De Filippi and Potts note, “[d]istributed ledgers are a technology for manufacturing consensus about facts that are instrumental to economic coordination, a role historically dominated in market capitalist economies by governments and large firms.”<sup>36</sup> The ledgers on which modern institutional structures and commerce are built are typically centralized not only in governments, but also in layers of bureaucracy and extra-governmental bodies, such as corporations. In the case of copyright orphan works, generated because of a prohibition on registration as a formality to obtain copyright, the ledgers do not exist at all. By generating the consensus necessary for economic coordination, the blockchain provides an institutional logic uniquely useful for orphan works rights clearance. To date, the majority of interest in distributed ledgers and copyright has focused on producing registers of copyright protected works. However, understanding the various limitations for that application clarifies the greater benefits of applying the blockchain technology to enhancing the public domain.

### C. BLOCKCHAINS AND COPYRIGHT

Recent attention in copyright registries has focused on renewed forms of in-copyright registration, rather than public license or use systems. Mandatory registration of copyrighted works, however, would unquestionably violate the Berne Convention, and attempts to create copyright registries have experienced limited success;<sup>37</sup> this is true whether the registry was created by governmental agencies or

32. Jason Potts, et al., *Economics of Blockchain* (Mar. 8, 2015) (unpublished manuscript) (on file with <https://perma.cc/HS2E-8XUG>).

33. See, e.g., ØLNES, *supra* note 26, at 259.

34. Casey Kuhlman, *How I (Currently) Explain the State of Blockchains to Executives and Researchers*, MONAX (Aug. 10, 2015), <https://perma.cc/SB69-JJR3>, quoted in Atzori, *supra* note 27, at 19; see also Peters & Panayi, *supra* note 2, at 248 (arguing that distributed databases offer substantial benefits over traditional “master-slave” database structures that have only one authoritative source).

35. ØLNES, *supra* note 26, at 259; Potts, et al., *Disrupting Governance: The New Institutional Economics of Distributed Ledger Technology* (Jul. 19, 2016) (unpublished manuscript) (on file with <https://perma.cc/7BKL-JL4M>).

36. Potts, et al., *supra* note 32.

37. Berne Convention for the Protection of Literary and Artistic Works, *opened for signature* Sept. 9, 1886, 828 U.N.T.S. 221, S. Treaty Doc. No. 99-27, 99<sup>th</sup> Cong. (1986) (revised at Paris, July 24, 1979) art. 5(2).

the private sector. For example, the European Global Repertoire Database, which was supposed to aggregate information regarding musical works and associated rights, began to struggle after collecting societies withdrew their support for the project. Similarly, the U.K. Copyright Hub has not yet achieved its aim of simple licensing. Commercial attempts have fared little better. The International Music Joint Venture was formed in 2000 by a group of collection societies including the Dutch PRO Buma/Stemra, ASCAP from the U.S., PRS from the U.K., and the Canadian SOCAN. This ended in an ignominious failure, as did the International Music Registry project, which was backed by the World Intellectual Property Organization. A third attempt, the Global Repertoire Database, was equally unsuccessful, notwithstanding the presence of most of the important rights holders, CMOs, and numerous technology companies, together with significant funding. The attempt was first proposed in 2008, had a brief flowering from 2010 to 2013, and folded in 2014.<sup>38</sup>

In the past few years, voluntary, privately operated blockchain-based copyright registries have also proliferated.<sup>39</sup> These range in sophistication from simple proof of existence models—wherein works are hashed and time-stamped with the author holding onto the private encryption key giving them the ability to prove that a particular document was authored at a particular time—to more complex applications such as the real time tracking of transactions of rights. For example, it is possible to create a hash of a copyright work and place it on a blockchain, as a “proof of existence” of that file. By merely stringing these hashes on a blockchain, one can create a registry database that proves the existence of various copyright works at a given point in time and, unlike other copyright registry proposals, this approach does not require a centralised controlling institution for management and maintenance.<sup>40</sup> That hash can also be used to facilitate tracking of licenses and assignments of rights. That is, each time a copyright work is licensed or assigned, the transaction is entered on the blockchain, thereby creating a record of every transaction involving that work. Alternatively, “tokens” on a blockchain can represent copyright protected content. This approach uses “currency” to represent ownership of digital data and is often the approach suggested for real property registration.<sup>41</sup> Both of these methods use the affordances of the blockchain to reintroduce “property” characteristics to intangible digital content.<sup>42</sup> In more sophisticated iterations, we might see automating of

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38. See Klementina Milosic, *The Failure of the Global Repertoire Database*, HYPEBOT (Aug. 31, 2015), <https://perma.cc/D55E-96JH>; Chris Cooke, *PRS Confirms Global Repertoire Database “Cannot” Move Forward Pledges to Find “Alternative Ways”*, COMPLETE MUSIC UPDATES (Jul. 10, 2014), <https://perma.cc/WT6R-Q4V2>.

39. Jessie Willms, *Is Blockchain-Powered Copyright Protection Possible?*, BITCOIN MAGAZINE (Aug. 9, 2016), <https://perma.cc/9V88-K8ES>; ASCAP, PRS and SACEM Join Forces for Blockchain Copyright System, MUSIC BUSINESS WORLDWIDE (Apr. 9, 2017), <https://perma.cc/Z7PG-8HJQ>.

40. Willms, *supra* note 39; Michael Crosby et al., *Blockchain Technology: Beyond Bitcoin*, 2 APPL. INNO. REV. 6, 15 (2016).

41. Meni Rosenfeld, Overview of Colored Coins (Dec. 4, 2012) (unpublished manuscript) (on file with <https://perma.cc/TPP3-E3Y8>).

42. See Fairfield, *supra* note 2, at 2.

licensing according to conditions prescribed through scripting protocols such as those developed on the Ethereum blockchain, which will be used for rights management, as well as automating and directing the movement of currency in financial transactions.<sup>43</sup> This would involve copyright ownership and licenses being written in the form of “smart contracts,” to be uploaded and run on a blockchain.<sup>44</sup> These “contracts” are composed of code capable of transacting rights, records of which are apparent on the ledger.<sup>45</sup> They might be thought of as an intelligent escrow system that transfers interests or money according to an automated process rather than human intercession. Imagine an international freight logistics contract that is executed automatically once the recipient confirms delivery of the shipment in good order.<sup>46</sup>

In the case of copyright, smart contracts can thus facilitate licensing with individual parties transacting via software on the blockchain. Here, transactions would be primarily verified through code rather than through interacting with trusted intermediaries like a copyright collecting agency, or with the rights holders themselves. Smart licensing agreements, where the terms of a license are reflected in, or defined by, the smart contract, could similarly automate relatively complex rights management operations such as permission controls, attribution, and payment of royalties and mandates, based on the terms and conditions of a license. Several parties are working on integrating these ledgers with content distribution systems and codecs, to create fully integrated, rights managed, content ecosystems.<sup>47</sup>

Nonetheless, the use of blockchain for in-copyright registration and rights management is unlikely to be a panacea for orphan works or general copyright licensing, at least in the short term. Because of the pressure placed upon them to become profitable, start ups attempting to provide blockchain registration and rights management services do so without taking advantage of the disintermediation functions that blockchain affords. The international legal structure prohibiting formalities also makes registration difficult to incentivize. Further, the staggering quantity of content produced daily suggests any comprehensive approach would require highly distributed management, as well as an automation system, to be sufficiently comprehensive. On the other hand, the more that copyright material is

43. See Crosby et al., *supra* note 40, at 13; Vincenzo Morabito, *Smart Contracts and Licensing*, in *BUSINESS INNOVATION THROUGH BLOCKCHAIN* 101 (Springer 2017).

44. See, e.g., Kevin D. Werbach & Nicolas Cornell, *Contracts Ex Machina*, 67 DUKE L.J. (forthcoming Mar. 2017) (on file with DUKE L.J.); Fairfield, *Smart Contracts, Bitcoin Bots, and Consumer Protection*, 71 WASH. & LEE L.R. ONLINE 35 (2014).

45. The most popular implementation of a smart contract protocol is the Ethereum blockchain, using its proprietary Solidity language, although many alternatives exist. See SOLIDITY, <https://perma.cc/RF22-ZWGM> (last visited Oct. 22, 2017).

46. It is worth noting that many of these “smart contracts” still require a human “oracle” to translate some condition from the physical or spatio-temporal realm into a formal input in the contract (“The package arrived!”), or an “arbitrator” to make determinations when the execution condition is vague (“The package arrived within a reasonable time.”). See, e.g., Primavera De Filippi & Samer Hassan, *Blockchain Technology as a Regulatory Technology: From Code is Law to Law is Code*, 21 FIRST MON. 1 (2016).

47. Lester Coleman, *Bitcoin Blockchain Copyright Startup Blokai Raises \$950,000 Amid Rebrand*, CRYPTOCOINS NEWS (May. 25, 2017), <https://perma.cc/QB7H-UGB7>.

registered under voluntary systems, the more efficient any “diligent” search for a rights holder becomes. These copyright registration systems thus play a useful role in the general copyright ecosystem, without necessarily contributing, at least in the short term, to any particular structural change or reform. Accordingly, beyond creating new registries and transaction mechanisms for in-copyright works, we argue that there is value in using a blockchain-based registration system in concert with other technological mechanisms to create an orphan works clearance system that enhances the public domain. Understanding the utility of a blockchain based approach for orphan works clearance requires an understanding of the orphan works problem, and how legal architectures might be usefully deployed alongside new technological architectures, to achieve a viable and effective solution. A more complete understanding of the challenges surrounding orphan works is thus a necessary prerequisite to examining what a techno-legal architectural solution to this issue might look like.

#### D. ORPHAN WORKS

Changes in copyright administration regimes—including dramatic increases in the levels of content production, extensions of copyright terms, and the absence of formal registration—have generated ongoing challenges for copyright administration in the digital era. Not least of these challenges are “orphan works”—works for whom a rights holder cannot be readily identified in order to obtain relevant permissions and licenses, or works for which a copyright status cannot be determined.<sup>48</sup> Orphans arise in numerous contexts. In the context of cultural collections comprising analogue media, it may be the case that the creators of a particular piece of media are unknown or cannot be contacted, meaning their works cannot be digitized, exhibited or preserved and become destined for deterioration, degradation or obsolescence.<sup>49</sup> Alternatively, digital works are often created without sufficient patronage information—metadata that would identify rights holders. Even if initially attached, that patronage information may be removed during reproduction processes. This generates artificial roadblocks preventing dissemination and repurposing or recontextualizing of works, as the production of new cultural material becomes impossible without obtaining permission, even when all parties might endorse this sort of reuse and remixing.<sup>50</sup> The orphan works problem results in impediments to

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48. AUSTRALIAN LAW REFORM COMMISSION, *COPYRIGHT AND DIGITAL ECONOMY* 250 (2013), <https://perma.cc/E2QR-4XXR>.

49. PETER B. HIRTLE ET AL., *COPYRIGHT AND CULTURAL INSTITUTIONS: GUIDELINES FOR DIGITIZATION FOR U.S. LIBRARIES, ARCHIVES, AND MUSEUMS* 171–72 (2009); *In from the Cold: An Assessment of the Scope of Orphan Works*, JISC (Apr. 2009), available at <https://perma.cc/E5LL-RJ2K>.

50. Jerry Brito & Bridget Dooling, *An Orphan Works Affirmative Defense to Copyright Infringement Actions*, 12 MICH. TELECOMM. & TECH. L. REV. 75, 76 (2005) (arguing that much of our cultural raw material is outside the reach of creators because of the orphan works problem).

expression,<sup>51</sup> unintentional censorship,<sup>52</sup> and widespread structural and systematic infringement because users acquiesce to the risk of infringement actions by using works without permission.<sup>53</sup> Even though the risk of an action may be low, and even if use of works benefits the public without affecting the commercial interests of authors, use of these works without permission from the rights holder technically remains a copyright infringement. The problems with the current copyright system are clearly summarized by Laura N. Bradrick:

The orphan works problem is threefold: first, it stifles creativity by limiting the public's access to the piece; second, it defeats the economic incentive to create copyrightable works because no one can receive the potential royalty if the copyright owner cannot be found; and third, it undermines copyright law by forcing some orphan works users to violate infringement laws, despite efforts to comply.<sup>54</sup>

The result is that, in both digital and analogue scenarios, without prohibitively expensive searches for rights holders, works become effectively locked away from the public, incapable of legitimately contributing to the knowledge economy.<sup>55</sup>

The last ten to fifteen years have witnessed a series of reform proposals, along with market led mechanisms like the Google Books settlement<sup>56</sup> and various legal mechanisms addressing orphan works. These proposals generally include a combination of a reasonably diligent (or qualifying) search for a rights holder, a centralized orphan works database, and a license fee paid into escrow. Proposals vary in their preference for a copyright exception, a limitation on liability,<sup>57</sup> a

51. Olive Huang, *U.S. Copyright Office Orphan Works Inquiry: Finding Homes for the Orphans*, 21 BERKELEY TECH. L.J. 265, 273-74 (2006).

52. Joshua O. Mausner, *Copyright Orphan Works: A Multi-Pronged Solution to Solve a Harmful Market Inefficiency*, 55 J. COPYRIGHT SOC'Y U.S.A. 517, (2008).

53. Simon Canning, *Productivity Commission Sparks Widespread Anger Over Copyright Changes*, MUMBRELLA (Dec. 21, 2016), <https://perma.cc/SK23-C42T> (noting an average Australian Internet user engages in eighty copyright infringements per day).

54. Laura N. Bradrick, *Copyright—Don't Forget About the Orphans: A Look at a (Better) Legislative Solution to the Orphan Works Problem*, 34 W. NEW ENG. L. REV. 537, 538-39 (2012).

55. Although difficult to measure accurately, the scale of the issue is likely significant. For example, in 2011, the British Library reported that approximately forty percent of potentially in-copyright works in its collection were orphans. BARBARA STRATTON, BRITISH LIBRARY, *SEEKING NEW LANDSCAPES: A RIGHTS CLEARANCE STUDY IN THE CONTEXT OF MASS DIGITISATION OF 140 BOOKS PUBLISHED BETWEEN 1870 AND 2010*, 5 (2011), available at <https://perma.cc/EM3Y-RPEK>. A report to the European Commission in 2010 estimated the existence of approximately three million orphan books (about 13% of the number of in-copyright books) and 129,000 orphan film works. The report also estimated that 95% of newspapers from before 1912 and 90% of the photographic collections of museums (about seventeen million images) were orphan works. Vuopala, *supra* note 4, at 5.

56. See Alessandra Glorioso, Note, *Google Books: An Orphan Works Solution?*, 38 HOFSTRA L.R. 971, 994 (2010); James Grimmelmann, *The Elephantine Google Books Settlement*, 58 J. COPYRIGHT SOC'Y U.S.A. 497, 519-20 (2010).

57. See Huang, *supra* note 51, at 285-86 (discussing the various solutions that were proposed in response to the 2005 U.S. Copyright Office Orphan Works Inquiry).

statutory compulsory license,<sup>58</sup> or a voluntary or extended collective license.<sup>59</sup> Ex ante approaches require particular action taken *prior* to use in order to obtain a copyright exception or license.<sup>60</sup> These solutions define an orphan work according to the diligent search, verified by some body or agency. Other approaches permit immediate use of works as orphans, on the basis of a softer definition for orphan works, with any legal consequences only invoked if a rights holder subsequently emerges—at which point the quality of the user’s diligent search is examined. These are called *ex post* regimes because they afford limitations on liability or safe harbors *after* the use.<sup>61</sup>

Different approaches also facilitate different uses of orphan works for different users. For instance, the European Orphan Works Directive only permits non-commercial uses of orphan works by cultural institutions, defined as “publicly accessible libraries, educational establishments and museums, archives, film or audio heritage institutions and public service broadcasters.”<sup>62</sup> These cultural institutions may only reproduce or make the material available online within their public interest missions, for purposes like mass digitization and preservation or for low quality reproductions for catalogues.<sup>63</sup> Other approaches, for instance under extended collective licensing and compulsory licensing regimes, facilitate commercial uses by the public at large.

Whatever the approach taken to the orphan works problem, virtually all existing mechanisms and all proposed solutions arrive at undesirable compromises between competing interests and outcomes. Accordingly, there is renewed interest in global orphan works reform, especially considering the U.S. Copyright Office’s 2015 report on orphan works.<sup>64</sup> Other jurisdictions have also recognized the need for a solution. For example, the Australian Productivity Commission identifies orphan and out-of-commerce works as a key area for copyright reform.<sup>65</sup>

58. See Robert Kirk Walker, *Negotiating the Unknown: A Compulsory Licensing Solution to the Orphan Works Problem*, 35 CARDOZO L. REV. 983, 988–89 (2014).

59. See Maria Pallante, *Orphan Works, Extended Collective Licensing and Other Current Issues*, 34 COLUM. J.L. & ARTS 23, 31–32 (2010); see also UNITED STATES COPYRIGHT OFFICE, FISCAL 2015 ANNUAL REPORT 5 (2015), available at <https://perma.cc/RH5N-RG55> (recommending an extended collective licensing system).

60. See Stef van Gompel, *Copyright Formalities in the Internet Age: Filters of Protection or Facilitators of Licensing*, 28 BERKELEY TECH. L.J. 1425, 1426–27 (2013) (describing examples of *ex ante* approaches).

61. Maurizio Borghi, Kris Erickson & Marcella Favale, *With Enough Eyeballs All Searches Are Diligent: Mobilizing the Crowd in Copyright Clearance for Mass Digitization*, 16 CHI.-KENT J. INTELL. PROP. 135, 141–42 (2016).

62. Eleonora Rosati, *The Orphan Works Directive, or Throwing a Stone and Hiding the Hand*, 8 J. INTELL. PROP. L. & PRAC. 303, 308 (2013).

63. Directive 2012/28/EU of the European Parliament and of the Council of 25 October 2012 on Certain Permitted Uses of Orphan Works, 2012 O.J. (L 299) 5, 10, available at <https://perma.cc/19HU-5MPS>.

64. See UNITED STATES COPYRIGHT OFFICE, ORPHAN WORKS AND MASS DIGITALIZATION (2015), available at <https://perma.cc/C9NY-M9UR>.

65. AUSTL. GOV’T PRODUCTIVITY COMM’N, PRODUCTIVITY COMMISSION INQUIRY REPORT: OVERVIEW & RECOMMENDATIONS 33 (2016), available at <https://perma.cc/CLW6-2PQH>.



Many jurisdictions have yet to implement orphan works solutions, as they tend to interfere with property rights. Orphan works solutions generally require reallocation of property rights to specific persons or general members of the public.<sup>66</sup> These reallocations interfere with copyright's traditional provision of exclusive control over the use of one's work, transforming property rights into liability rights.<sup>67</sup> Orphan works approaches thus often receive opposition from various groups of content creators, typically professional visual and graphic artists, and especially professional photographers.<sup>68</sup> With certain elements of different approaches offending each group differently, no single approach affords a killer solution. All mechanisms include tradeoffs in scope and utility on the basis of ideological or practical concerns. However, we argue that new technologies have the capacity to drastically improve outcomes and overcome many of the obstacles associated with existing mechanisms.

In Part II, we therefore outline our blockchain solution to the orphan works problem and contrast it with the many different proposals that others have made. Our conclusion will be that the implementation of a technical solution avoids problems that have beset other solutions.

## II. A TECHNICAL ARCHITECTURE

Below is a general outline of the technical formation we propose to enable public use of orphan works. It involves: (1) an automated system capable of performing a "diligent search"; (2) a blockchain registry of all searches undertaken for a particular work; and (3) a legal mechanism that can deploy that registry towards orphan works (as well as other light-permission works) clearance. We do not prescribe here exactly which sorts of works should be available under this system—the approach described will work for a range of orphan works and lightly-permissioned works. The goal here is to outline the various possibilities that the technology can enable.

### A. AUTOMATED DILIGENT SEARCH

A diligent or "qualifying" search for rights holders remains a central concept for most orphan works proposals, since the inability to determine or locate a rights holder is often what defines particular content as orphaned.<sup>69</sup> Unfortunately, a diligent search is an onerous requirement and empirical research suggests it is often so

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66. Dennis W. K. Khong, *Orphan Works, Abandonware and the Missing Market for Copyrighted Goods*, 15 INT'L J.L. & INFO. TECH. 54, 64 (2007).

67. See generally Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1092 (1972).

68. See, e.g., *The Orphan Works Problem*, STOP43, <https://perma.cc/K8U9-SFWY> (last visited Nov. 8, 2017); *Orphan Works in the Frame*, THE IPKAT (Aug. 7, 2012), <https://perma.cc/KG67-M24P>; *No Longer In Limbo – Orphan Works*, THE ECONOMIST, (May 2, 2013), <https://perma.cc/J7CU-5AZX>.

69. Orphan Works Act of 2008, H.R. 5889, 110th Cong. § 2(a)(2)(A) (2008) (seeking to introduce more rigid standards for diligence).

onerous that it prevents rights clearance,<sup>70</sup> especially in large scale projects like mass digitization.<sup>71</sup> For instance, the Vuopala report to the European Commission identified the high transaction costs associated with rights clearance within the context of cultural institutions,<sup>72</sup> noting exorbitant clearance costs for relatively limited numbers of works.<sup>73</sup> The report concluded that: “The information gathered shows that on [sic] nearly every sector too much time and effort have been spent on clearing of rights for the digitisation and online accessibility of works in collections of cultural institutions.”<sup>74</sup>

Delivering what constitutes a diligent search has proved challenging and generated significant political argument and opposition. While larger commercial technology and media interests might push for flexibility in what constitutes a diligent search, other stakeholders prefer firmer criteria, criticizing flexibility as a move to exploit the work of “hard to reach” copyright owners and reduce the number of lawsuits for infringements from larger commercial interests in the creative field.<sup>75</sup> The question of which entity should be tasked with verifying the diligence of a search, and thus ultimately how a work is legally characterized as orphaned, remains contested.<sup>76</sup> Should it be left to users and only verified through litigation in an ex

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70. Marcella Favale, Simone Schroff & Aura Bertoni, *Requirements for Diligent Search in the United Kingdom, the Netherlands, and Italy*, ENDOW 38 (2016), available at <https://perma.cc/7GWV-3XMT>; Borghi et al., *supra* note 61, at 149 (referencing a meta-study by the University of Glasgow).

71. Vuopala, *supra* note 4, at 44.

72. *See id.* at 23 (discussing “grey materials”).

73. The report found that: “The National Archive in the UK spent £35,000 and 2 years on clearing copyright for the digitisation and online accessibility of 1,114 old wills. In less than half of the cases the project managed to find the rights holders and to obtain permission to make them available online. A university library in Austria digitised 200,000 doctoral dissertations from 1925–1988 based on a limitation. The dissertations cannot be made accessible online because of the disproportionately high transaction costs involved in clearing the rights for them. The cost of digitisation was 150,000 euro. The library estimates that the transaction cost would be 20–50 times higher than cost of digitisation. . . . A UK project digitising posters from the 1980’s spent £70,000 in transaction costs for clearing the rights for just 1,400 posters. As part of a major digitisation project of (audio-) visual material in the Netherlands (Beelden voor de Toekomst), the total cost of handling rights clearance for 500,000 photographs and 5,000 films has been estimated to be 625,000 [euro]—3 people will be clearing rights for 4 years in this project.” Vuopala, *supra* note 4, at 5–6.

74. *Id.* at 35. There were equally striking findings from the UK Intellectual Property Office. *See* U.K. INTEL. PROP. OFF., FINAL IMPACT ASSESSMENT ON ORPHAN WORKS 7–11 (2012), available at <https://perma.cc/22TZ-2SMJ>. *See also* DAVID HANSEN, DIGITIZING ORPHAN WORKS: LEGAL STRATEGIES TO REDUCE RISKS FOR OPEN ACCESS TO COPYRIGHTED ORPHAN WORKS 26–29 (Kyle K. Courtney & Peter Suber eds., 2016) (providing a general overview of these issues), available at <https://perma.cc/NQ3D-9TYC>.

75. Christian L. Castle & Amy E. Mitchell, *Unhand That Orphan: Evolving Orphan Works Solutions Require New Analysis*, 27 ENT. & SPORTS LAW. 1, 21 (2009).

76. The impact of having to perform a diligent search also affects different users in different ways. David R. Hansen, Gwen Hinze, and Jennifer Urban have outlined the different entities that are actively tasked with performing a diligent search, as well as the different echelons of formality for diligent search and, accordingly, the different parties that need to verify the adequacy of a search. These might be: (1) users who perform the search alone, with no formal systems to guide or verify their efforts (such as in the failed U.S. limited liability proposals discussed below); (2) cultural institutions as verified by national and supranational bodies (such as under the EU Orphan Works Directive); (3) government copyright offices (at least to verify a search, as in the Canadian compulsory license model); or (4) collective management

post approach? Or should verification be performed by a private firm or a government agency with the result a statutory compulsory license?<sup>77</sup>

We suggest that the task of verifying the diligence of a search is dramatically simplified with a comprehensive record of all searches, and further that the production of a comprehensive record of searches is dramatically simplified and improved when the diligent search is performed by an automated expert system. There has already been some discussion of automated legal expert systems performing diligent searches for the sake of copyright exceptions under the E.U. Orphan Works Directive. The Accessible Registries of Rights Information and Orphan Works Towards Europeana (“ARROW”) project began in 2008 as an endeavour to facilitate rights management within digitization projects.<sup>78</sup> Stakeholders included national libraries, bibliographic agencies, publishers and authors associations, and copyright management organizations in various countries. One of ARROW’s goals, amongst others, was to automate as far as possible the diligent search process.<sup>79</sup> The project was structured around: (1) a web portal interface; (2) a rights information infrastructure that enabled a user to retrieve copyright status and ownership information from a network of databases, including libraries, databases of books in print, and repertoires of reproduction rights organizations; and (3) a registry in which that information could be deposited, including a subsection of the registry referring to works that were declared “probably orphan” as a product of users filtering information through the portal.<sup>80</sup> The project was limited, however, in terms of the kinds of works it applied to; only books and manuscripts were covered. Further, it is not a publicly available system, with only specific users contemplated by the interface and framing. Its development ended in 2013.

A more sophisticated proposal is found in the EnDOW “Diligent Search” project, which is being researched and built by the CREATE group.<sup>81</sup> This project also seeks automation of diligent search, ostensibly under the auspices of both the EU copyright exception and the UK orphan works licensing regime.<sup>82</sup> Both these orphan works mechanisms require a diligent search, after consultation of a number of “appropriate

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organizations (under extended collective licensing models, which, as discussed below, may produce a conflict of interests and transparency issues). See David R. Hansen et al., *Orphan Works and the Search for Rightsholders: Who Participates in a “Diligent Search” Under Present and Proposed Regimes?* (Berkeley Digital Library Copyright Project, White Paper No. 4, 2013), available at <https://perma.cc/Y54T-HZ2C> [hereinafter, Hansen White Paper].

77. Bradrick, *supra* note 54, at 539 (arguing that a key reason why the Orphan Works Act of 2008 failed to become law was because of the uncertainty surrounding what constituted a “diligent search”).

78. Cinzia Caroli et al., *ARROW: Accessible Registries of Rights Information and Orphan Works Towards Europeana*, 18 D-LIB MAG. (Jan.–Feb. 2012), <https://perma.cc/8LP4-P7VW>.

79. Along with demonstrating how to handle digital copyright problems in practice, foster collaboration between authors, publishers and libraries, and provide contact information for rights holders.

80. Caroli et al., *supra* note 78.

81. Kristofer Erickson, *How Crowdsourcing Might Solve the Astronomical Challenge of Copyright Clearance*, CREATE BLOG (Jan. 8, 2016), <https://perma.cc/WCJ3-KP6U>.

82. Introduced under the Enterprise and Regulatory Reform Act 2013, c. 24, § 77 (Eng.), amending Copyright, Designs and Patents Act 1988, c. 48, § 116A (Eng.).

sources.” Although those sources are not specified in the legislation, there is guidance, produced by the Intellectual Property Office, as well as sources listed in Regulations,<sup>83</sup> which include the various orphan works registries. The UK Copyright Designs and Patent Act 1988 also specifies some sources.<sup>84</sup> Following those guiding documents, the EnDOW project has produced a decision support system capable of querying orphan works repositories<sup>85</sup> for the purpose of satisfying the diligent search criteria in the exception and licensing regime. The rationale is overcoming the transaction costs associated with diligent search for cultural institutions.<sup>86</sup> Their system requires inputs such as: “Who is the author?,” “When did the author die?,” “To whom have the rights been transferred?,” and so on.<sup>87</sup> They have produced elaborate decision trees that encode the complexities of the existing laws.

EnDOW researchers have broadened their proposal by suggesting extending the use of crowdsourcing to incentivise orphan works clearance.<sup>88</sup> The system is thus open to the public, including international users—following the requirements of every jurisdiction in which it would operate—for the purpose of clearing rights on behalf of cultural institutions.<sup>89</sup> The utility of the scheme is an automated system capable of performing accurate and legally “valid” diligent searches on items contained in the collections of cultural institutions.<sup>90</sup>

While this endeavour should be lauded, further developments could increase the range and efficacy of such a system. For digital or digitized works, a copy of the work itself including as much descriptive metadata as possible could be an input for the system.<sup>91</sup> That data could then be searched against metadata and multimedia fingerprints in specified repositories, catalogues and registries.<sup>92</sup> Content ID and fingerprinting (also known as perceptual hashing or content-based media identification),<sup>93</sup> could operate through the production of “signatures” that

83. The Copyright and Rights in Performances (Licensing of Orphan Works) Regulations 2014, SI 2014/2863 (Eng.); Erickson, *supra* note 81.

84. Copyright Designs and Patent Act, 1988, c.48, sch. ZA1 (Eng.).

85. Borghi et al., *supra* note 61, at 150-51 (suggesting that between 30%-50% of databases required to begin a diligent search were not publicly available).

86. *Id.* at 152.

87. Borghi et al., *supra* note 61, at 163; Aura Bertoni, Flavia Guerrieri & Maria Lillà Montagnani, *Requirements for Diligent Search in 20 European Countries*, ENDOW (June 2017), <https://perma.cc/USZ9-GGA7>.

88. Borghi et al., *supra* note 61, at 157; Erickson, *supra* note 81.

89. Borghi et al., *supra* note 61, at 159-60.

90. *Id.* at 162-63.

91. For works that do have alphanumeric identifiers, there are also issues around consistent spelling that could be addressed using fuzzy logic and neural networks capable of comparing works with similar but non-identical titles and identifying information.

92. An adequately sophisticated iteration of this expert system would, if an author were identified, and their work were found on an adequately sophisticated registry, inform the user of the necessary licensing conditions, and facilitate a transaction, on the basis of a block chain based smart contract, rather than requiring negotiation with the owner directly. In this way, the system also functions as a clearing house for in-copyright works.

93. Sunil Lee & Chang D. Yoo, *Robust Video Fingerprinting for Content-Based Video Identification*, 18 IEEE: TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECH. 983, 983 (2008), <https://perma.cc/U3CX-44CL>.

summarise particular media or multimedia content,<sup>94</sup> or certain unique features of that content.<sup>95</sup> The fingerprint would be run through a matching algorithm to identify the closest match for<sup>96</sup> the unlabelled content to any corresponding fingerprints stored in databases that reference metadata, thus identifying copyright owners and ownership status.<sup>97</sup> Signatures might be in the form of, amongst others, waveforms and wavelets (for audio), or cryptographic hashes (wherein hash values rather than whole files are compared). Unfortunately, hashing is generally too sensitive to content manipulation to be particularly useful for content ID, as it fails if a user makes “minor modifications to a given multimedia document that would result in a significantly different fingerprint.”<sup>98</sup> As has been noted, “hash values are fragile, a single bit flip is sufficient for the hash to completely change,” an observation that suggests the need for a hash protocol sufficiently robust to guard against content-preserving transformations.<sup>99</sup> Nevertheless, content ID systems would prove extremely useful to whatever degree they could match queried content with material relevant repositories, even if they only produce percentage likelihoods of matches.

Another way to expand the utility of automated diligent search is by opening the system to the public to facilitate clearing works for users’ own benefit, rather than only cultural institutions. This takes the system beyond the horizons of the EU Orphan Works exception. Indeed, the idea of crowd-sourcing for the sake of clearing rights on behalf of cultural institutions would make more sense if the crowd were incentivized. If the licensing regime were opened to the public at large and users could perform, and potentially pay for, a diligent search for a work as the need arose, then one might expect broader use of the system. This would result ultimately in a far more prolific clearance and registration system for orphan works. We suggest, therefore, that a broad open access platform would become far more useful if a use right could be obtained by the public at large for a variety of uses, including commercial uses. This would incentivize numerous parties to channel works through the platform. The EnDOW project discovered the problem of limited access (i.e. payment required) for some databases and catalogs necessary to perform diligent searches effectively. The technical architecture’s user interface might overcome this with an upfront fee that covered access to relevant databases.

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94. Note that this is different from audio watermarking “in which an arbitrary message can be embedded in a recording without altering the perception of the sound.” Pedro Cano et al., *Audio Fingerprinting: Concepts and Applications*, in *STUDIES IN COMPUTATIONAL INTELLIGENCE, COMPUTATIONAL INTELLIGENCE FOR MODELLING AND PREDICTION* 234, 234 (Saman K. Halgamuge & Lipo P. Wang ed., Springer 2005). Fingerprinting is a more useful mechanism than watermarking for our purposes because watermarking requires the wherewithal to include metadata, which suggests the owners is already acting to protect their copyright, whereas fingerprinting can be applied after the fact.

95. Avinash L. Varna et al., *A Framework for Theoretical Analysis*, 7541 *MEDIA FORENSICS & SECURITY* II 1, 1-2 (2010).

96. Lee & Yoo, *supra* note 93, at 985.

97. Pedro Cano et al., *A Review of Audio Fingerprinting*, 41 *J. VLSI SIGNAL PROCESSING* 271, 271 (2005), <https://perma.cc/KUN9-8VMQ>.

98. Varna et al., *supra* note 95, at 1.

99. Cano et al., *supra* note 97, at 271.

The final augmentation of automated diligent search, one that effectively facilitates verification of search diligence by producing consensus around the status of a works' author, would be combining the expert system with a distributed registry that records performed searches and a smart license implementation system. Under the EnDOW model, verification of searches performed by the system remains a necessity. The authors note:

In order to be practicable for cultural institutions, the guided diligent searches performed by end-users would require review and approval by the cultural institution holding the item, ensuring that the requirements of national legislation and the best practices of the specific sector are met, but also increasing costs relative to a purely automated system. By automating laborious parts of the processes, and automatically adapting search instances to relevant legislation, the crowdsourcing system could still be expected to reduce costs.<sup>100</sup>

However, as we argue in the sections that follow, the inclusion of a blockchain registry would improve the efficiency of the verification process, and might result—in due course—in a fully automated system of orphan works licensing.

## B. BLOCKCHAIN ORPHAN WORKS REGISTRY

As discussed above, we do not see copyright registration as the most effective implementation of orphan works. That said, registries specific to orphan works have not proved particularly viable or useful either. For example, orphan works registration is part of the European Orphan Works Directive.<sup>101</sup> Administered by a central European body, the orphan works database provides information about works cleared as orphans under the European regime, ostensibly in order to avoid search duplication. However, because of the narrow scope of the European system, the database has limited utility. As it only applies to digitization of works actually held physically in a cultural institution's collection, search duplication is never likely to occur—for example, because it is widely known that the Louve owns the *Mona Lisa*, a search for its painter need only ever be conducted by one institution. This probably accounts for the fact that while there are barely more than two thousand entries in the European Orphan Works database at the time of writing,<sup>102</sup> the national UK database does not even have five hundred.<sup>103</sup> More useful projects include ARROW<sup>104</sup> (discussed above) which includes a register of works declared “likely orphan” as part of a broader rights management project,<sup>105</sup> the European MILE (“Metadata Image Library Exploitation”) project which looks at possibly-orphaned fine art images, and a register that was absorbed into the WATCH (“Writers Artists

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100. Borghi et al., *supra* note 61, at 161.

101. Vuopala, *supra* note 4.

102. ORPHAN WORKS DATABASE, <https://perma.cc/ZNJ7-DWQX> (last visited Oct. 14, 2017).

103. *Orphan Works Register*, GOV.UK, <https://perma.cc/BJF2-RZTB> (last visited Oct. 14, 2017).

104. Caroli et al., *supra* note 78.

105. *Id.*

and Their Copyright Holders”) registry.<sup>106</sup> Whatever success they have had is difficult to measure however, and the number of entries in all orphan works databases combined is a barely perceptible fraction of the estimates of the total number of orphan works.

Other proposals include “intent to use” registries,<sup>107</sup> in which people intending to use works believed to be orphaned register in a central database accessible by owners.<sup>108</sup> This might be effective to demonstrate the availability of equitable defenses, like *laches*, or as a step in due diligence to obtain a compulsory license.<sup>109</sup> Whichever of these approaches is considered more desirable, automation and search diligence auditability of such a registry are critical innovations the technical platform we propose would provide. If processes of diligent search can be automated, then there can also be automated population of an orphan work registry for the purpose of subsequent administrative verification, use-notification, or even non-exclusive compulsory licenses. Indeed, with the amount of content produced daily with insufficient metadata to facilitate identification of copyright status, it seems unfathomable that a centrally administered database, especially one managed by human functionaries, could achieve useful scale. For those reasons, we propose a technical registry infrastructure that is automated and decentralized, which would be populated by users of the system rather than a central administrative body.

The orphan works blockchain platform we propose would operate as a distributed ledger that collects and records every time a search for the owner of a work is completed. An orphan works search database of this sort would perform a range of functions. First, it could facilitate auditing of search diligence. A permanent, dynamic, continually updated record of relevant searches for the author of a work would be associated with an entry on a register, either through a link to the content itself or through identifying metadata sufficient to create a unique entry for each orphan work or work in the public domain. As noted in the last section, this would be initially populated by a transparent diligent search expert system, or at least a

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106. See Tim Padfield, *Preserving and Accessing Our Cultural Heritage – Issues for Cultural Sector Institutions: Archives, Libraries, Museums and Galleries*, in *COPYRIGHT AND CULTURAL HERITAGE: PRESERVATION AND ACCESS TO WORKS IN A DIGITAL WORLD* 195, 205 (Estelle Derclaye ed., Edward Elgar 2010).

107. A distributed registry, depending on how any orphan works solution were oriented, could function initially to broadcast an intention to obtain a licence or use right, thereby giving “notice” to the public, with automated development into a license after a designated period. Brennan and Fraser, for example propose a regime involving “three sequential stages” of notice, including a “diligent user search and lodgement of a public notice, then after three months... a remedial limitation if the owner comes forward, then after three years . . . a compulsory licence administered by the declared collecting society.” See David Brennan & Michael Fraser, *The Use of Subject Matter with Missing Owners – Australian Copyright Policy Options*, 23(1) *AUSTL. INTELL. PROP. J.* 4, 13 (2012). A sophisticated approach to writing orphan works licenses as smart contracts could enable those stages to be fully automated without the need for a central collecting society as they propose.

108. See Duke Center for the Study of the Public Domain, *Orphan Works Analysis and Proposal* (Mar. 2005), <https://perma.cc/P7M8-G6LG>.

109. Joshua O. Mausner, *Copyright Orphan Works: A Multi-Pronged Solution to Solve a Harmful Market Inefficiency*, 12 *J. TECH. L. & POL’Y* 395, 416 (2007).

platform capable of recording searches conducted. Depending on the legal model for orphan works use adopted, this register of searches could be employed by potential users to convince themselves of the diligence of existing searches for authors and avoid search duplication. Alternatively, it could be used by an administrative body tasked with verifying the diligence of a search, as would be performed in the case of orphan works compulsory licensing. As will be discussed below, with sufficiently sophisticated programming and the right legal definitions, this record of searches could similarly inform a technological system that a threshold of diligence has been reached. Beyond a record of searches, the register could, in certain situations, operate as an authoritative register of intent to use. In concert with relevant legal mechanisms, this could constructively fix copyright holders with notice of a potential orphanhood claim.

Further, if the register were implemented in association with particular legal reform, it could adopt the character of a real property register under a Torrens system.<sup>110</sup> Under this system of property interests, existing rights are not validated or perfected by the act of registration, but instead become vested through the very act of registration. If this type of property system were implemented within the orphan work regime, the register itself would become part of the technological constellation that delivers works into orphanhood. In other words, the distributed ledger would not register the right to use an orphan work, but rather grant the use right through the process of registration.<sup>111</sup> In that way, the registry could vastly enhance the public domain by actively communicating a “public license to use” for certain works. Torrens registration systems were implemented for real property in the early 19<sup>th</sup> century to avoid the difficulties of proving “good chain of title”—which is to say, determining the “true” property owner of property.<sup>112</sup> It is not difficult to see the same system having utility in the context of the orphan works problem.

Finally, the existence of an orphan works blockchain register would allow automatic licensing of orphan works through the coding and execution of compulsory “smart contracts” licences hosted on the register. In that way, the status of a work could remain dynamic over time, with the conditions of use being controlled according to the legislative environment as well as user input.

A blockchain registry of this sort could also be expanded beyond orphan works to include other lightly-permissioned works, such as a Creative Commons “attribution only” work,<sup>113</sup> or for other permissionless uses, such as out-of-commerce works. Smart public licenses could therefore interact with in-copyright registries to automate movement between registries when copyright material falls out of term, or is deemed

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110. See, e.g., R.G. Patton, *The Torrens System of Land Registration*, 19 MINN. L. REV. 519, 519 (1935).

111. *Frazer v. Walker* (1967) 1 AC 569, which outlines the significance of registration of real property under a Torrens regime.

112. Douglas Baird & Thomas Jackson, *Information, Uncertainty, and the Transfer of Property*, 13 J. LEG. STUD. 299 (1983).

113. See generally Creative Commons, *About the Licenses: What Our Licenses Do*, <https://perma.cc/X8SZ-XP3R>.



to the public domain.<sup>114</sup> It could also automate attribution mechanisms.<sup>115</sup> This would remedy the situation, identified by a range of scholars that we do not have a mechanism to irreversibly dedicate a work to the public domain.<sup>116</sup> These forms of disintermediation and automation of copyright management therefore offer potential for the type of higher level structural copyright reform sought for and theorized about for decades.

### C. TECHNO-LEGAL SOLUTIONS

Our proposal is not the only technologically-mediated approach to the orphan works problem. However it is the only one which is extensible and has a range of advantages over other approaches. It includes commercial purposes, allows an automated distributed registry where “smart licenses” can transact rights over orphan works and lightly-permissioned works, and can disintermediate the equivalent of a centralized copyright licensing function into a technical system.

There are a range of other possibilities that emerge from implementing this type of technology. Notably, it can be used to provide for automated escrow, where a potential user could pay a license fee in case a rights holder does emerge.<sup>117</sup> Although there are arguments that use of orphan works should not be predicated on any license fee at all, a blockchain system could accommodate such payment into escrow, in the form of smart contracts or smart trusts that can facilitate a market clearing mechanism for orphan works. Yet that question lies outside of the scope of this Article.

With the technical architecture established, it is now time to discuss the necessary legal architectures to make the technical proposal possible.

## III. LEGAL ARCHITECTURES

As the outline above demonstrates, technology alone cannot produce a feasible orphan works clearance system. Legal reform is also necessary to produce a holistic approach for the liberation of orphan works. In this Part, we explain how the

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114. David Hansen, for instance, does acknowledge that it is often difficult to distinguish these categories, and public domain works are often treated as orphans. HANSEN, *supra* note 74, at 11; See also Daniel J. Gervais & Dashiell Renaud, *The Future of United States Copyright Formalities: Why We Should Prioritize Recordation, and How to Do It*, 28 BERKELEY TECH. L.J. 1459, 1478 (2013) (discussing public domain deeding, specifically referring to Lessig’s model and the inversion of the idea that formalities must be a burden, wherein Lessig argues that a registry could encourage willing creators to dedicate their works to the public domain before the copyright in those works expired).

115. Some have proposed coding those licenses to provide usage data back to authors as a form of gratitude. See Lance Koonce, *Please Share with Gratitude: How Blockchain Technology Can “Light up the Commons,”* LEXOLOGY (Aug. 3, 2016), <https://perma.cc/7FZK-3AHP>.

116. Gervais & Renaud, *supra* note 114, at 1494.

117. Some have argued that such a fee should be equivalent to a properly negotiated licensing fee for the use of a work as if the owner had been located. See Darrin Keith Henning, *Copyright’s Deus Ex Machina: Reverse Registration as Economic Fostering of Orphan Works*, 55 J. COPYRIGHT SOC’Y U.S.A. 201, 218 (2008).

technological platform described above might be complemented by, or incorporated within, certain proposals for orphan works legal reform. We are generally agnostic to the form that such legal amendment might take. However, the technological system we propose engages more successfully with certain reform options than others. Accordingly, various orphan works reform proposals, and how they might interact with an automated diligent search and blockchain based registry, are discussed below.

#### A. NON ORPHAN-WORKS-SPECIFIC COPYRIGHT EXCEPTIONS

Before looking at orphan works specific approaches, it is worth briefly discussing certain existing legal mechanisms with applicability to orphan works and how they might be augmented or undermined by the technological system described above. Although these do not necessarily provide the structural changes necessary to address copyright's shortcomings, they should not be underestimated. To date, there are no examples of a cultural institution being found guilty of copyright infringement through use of orphan works.<sup>118</sup> That is, however, also largely due to risk averse copyright management strategies.<sup>119</sup> David Hansen has produced an impressive analysis of how these various existing mechanisms assist strategic use of orphan works by libraries and cultural institutions.<sup>120</sup> However, many of these strategies are limited in their applicability to particular users and uses, and therefore do not afford the structural adjustments necessary to incentivise public use of the system we have outlined. Nevertheless, the analysis still exposes certain benefits to the technologically-driven approach.

The equitable doctrine of laches limits recourse for those that have “slept on their rights,” and is one example of an existing legal mechanism with potential utility for orphans. Any use of an orphan work increases in legitimacy if the owner can be made aware, or constructively aware, of the use, and yet takes no action to intervene. A blockchain register producing public notification of such use could participate in

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118. HANSEN, *supra* note 74, at 2; *id.* at 18 (discussing how in the U.S., there are only 8 judicial opinions using the term “orphan works,” and only two cases that directly address questions around orphans (The Authors Guild Inc., et al. v. Google, Inc., 804 F.3d 202 (2d Cir. 2015); The Authors Guild Inc., v. HathiTrust, 755 F.3d 87 (2d Cir. 2014))).

119. See generally Hirtle, *supra* note 49, especially Chapter 10.

120. See generally HANSEN, *supra* note 74; for example, Hansen discusses the application of 17 U.S.C. § 108 (1976) to orphan works. *Id.* at 33-42. However, he notes these sections permit only single copy duplication, not systematic reproduction and derivative use, *id.* at 5, which are the goals of the system. “Take down” policies are also a relatively useful mechanism for dealing with rights holders emerging after a subsequent use. See David Hansen, Kathryn Hashimoto, Gwen Hinze, Pamela Samuelson & Jennifer M. Urban, *Solving the Orphan Works Problem in the United States*, 37 COLUM. J.L. & ARTS 1, 41 (2013). They become more problematic when the orphan work has been incorporated in a derivative or transformative use, as taking down the orphan work will ultimately eliminate the capacity to exhibit the complimentary creative work that has occurred on the back of the orphan work. Accordingly, for the sake of certainty, it is better to avoid any contingency dependent on the emergence of a rights holder. Once a work is deemed orphaned, there should be a license permitting use of that work for whatever purposes, without risk that such a use might eventually be challenged.

producing constructive notice to be fixed on a copyright owner. Copyright legislation already specifies that acts of recordation with the Copyright Office may result in constructive notice of the contents of those documents.<sup>121</sup>

Fair use is another tool for orphan works users and mass digitizers.<sup>122</sup> However, fair use sits uneasily with the requirements for orphan works clearances. In particular, the focus on market usurpation in a fair use analysis is problematic when considering works for which there is no market and where there is no information about whether the creator wishes them to be available for market exchange.<sup>123</sup> A blockchain register would assist in demonstrating the absence of commercial competition between the original rights holder's market and that of a subsequent user.<sup>124</sup> Additionally, the contours of what is "fair" may not achieve a sufficiently useful result. For instance, the fair use justification of the *Google Books* court, and the snippets that decision affords users, are hardly what would have been available under a successful Google Books settlement.<sup>125</sup>

## B. STRUCTURAL COPYRIGHT REFORM

There have been general proposals for copyright law reform that could ameliorate orphan works issues. The approaches below typically involve substantial adjustment to copyright law, to ensure copyright rules "serve policy objectives in the digital

121. 17 U.S.C. § 205(e) (2010).

122. See Lydia Pallas Loren, *Abandoning the Orphans: An Open Access Approach to Hostage Works*, 27 BERKELEY TECH. L.J. 1431 (2012); Megan L. Bibb, Note, *Applying Old Theories to New Problems: How Adverse Possession Can Help Solve the Orphan Works Crisis*, 12 VAND. J. ENT. & TECH. L. 149 (2009); Aryeh L. Pomerantz, *Obtaining Copyright Licenses by Prescriptive Easement: A Solution to the Orphan Works Problem*, 50 JURIMETRICS J. 195 (2010); Jennifer Urban, *How Fair Use Can Help Solve the Orphan Works Problem*, 27 BERKELEY TECH. L.J. 1379 (2012); Matthew W. Turetzky, *Applying Copyright Abandonment in the Digital Age*, 2010 DUKE L. & TECH. REV. [i] (2010); HANSEN, *supra* note 74, at 18-25; William F. Patry & Richard A. Posner, *Fair Use and Statutory Reform in the Wake of Eldred*, 92 CAL. L. REV. 1639 (2004). See also Response from the Library Copyright Alliance to the Copyright Office's Orphan Works Report (June 15, 2015), <https://perma.cc/3HV2-B6NL> (responding to criticism of the fair use approach to orphan works); Stanford University Library, Comments on Orphan Works & Mass Digitization Report (Oct. 9, 2015), <https://perma.cc/GUL4-YJB4> (recognizing importance of fair use rationale for orphan works' uses, but advocating for a further legislative solution to supplement fair use); HANSEN, *supra* note 74, at 19 (arguing fair use is probably itself the best solution to the orphan works problem); AUSTL. PRODUCTIVITY COMM'N, *Intellectual Property Arrangements 193-97* (2016) (suggesting orphans, as well as out-of-commerce works, might be addressed by reforming the existing fair-dealing copyright exceptions into less purpose specific fair use exceptions).

123. See e.g., Ian McDonald, *Some Thoughts on Orphan Works*, 24(3) COPYRIGHT REP. 152, 181-182 (2006), [https://web.archive.org/web/20070829141118/http://www.copyright.org.au/pdf/acc/articles\\_pdf/a06n05.pdf](https://web.archive.org/web/20070829141118/http://www.copyright.org.au/pdf/acc/articles_pdf/a06n05.pdf).

124. Peter Groves, *There's Nothing New Around the Sun: Everything You Think of Has Been Done*, 18(4) ENT. L.R. 150 (2007).

125. See generally Thomas E. Wilhelm, *Google Book Search: Fair Use or Fairly Useful Infringement*, 33 RUTGERS COMPUT. & TECH. L.J. 107 (2006); Jonathan Band, *Google and Fair Use*, 3 J. BUS. & TECH. L. 1 (2008).

age.”<sup>126</sup> These include adjustments to term length,<sup>127</sup> the possibility of renewal,<sup>128</sup> and mandatory recordage.<sup>129</sup> While potentially useful, these approaches often contradict international obligations under the Berne Convention and TRIPS agreements, and are, as a result, dead-on-arrival.<sup>130</sup> However, blockchain registry technologies might allow for the practical reintroduction of registration incentives, and thereby “reformatize” copyright.

It is beyond dispute that the abolition of formalities in copyright law was a primary cause of the orphan works problem. Although “formalities” are not deterministically defined, they include the administrative obligations necessary for a copyright to exist and for the right to continue or remain practically available.<sup>131</sup> As those formal requirements for obtaining copyright protection were abolished, copyright transformed from an “opt-in” to an “opt out” system, where all works became immediately subject to copyright protection as soon as they were expressed in a tangible medium.<sup>132</sup> As described in the dissenting judgment of Justice Black in *Washingtonian Publication Co. v. Pearson*, formalities like registration and deposit with the copyright office were “intended to record publicly full and complete information about a work for which copyright is claimed and to make that work

126. Maria A. Pallante, *The Curious Case of Copyright Formalities*, 28 BERKELEY TECH. L.J. 1415, 1419 (2013) (stating that to “serve the policy objectives of the digital age . . . we must remake the law”).

127. For instance, Posner and Landes argue for indefinitely renewable copyright, offering compelling economic rationales for a reduced initial mandatory copyright term coupled with shorter but indefinitely renewable subsequent opt-in terms. See William M. Landes & Richard A. Posner, *Indefinitely Renewable Copyright*, 18 U. CHI. L. REV. 471 (2003). Posner and Landes also stress that a failure to opt-in via registration would thus place the copyrighted material in the public domain, affording a useful mechanism for “filtering” commercially valuable copyright materials into ultimately achieving protection. *Id.* However, this approach would unquestionably violate the Berne Convention, as would, arguably, even less radical legislative proposals, such as the Public Domain Enhancement Act, 2408 H.R. (2006), that would have, without a mandatory shortening of the copyright term, introduced renewal requirements for retaining the final twenty years of copyright protection as a mode of demonstrating maintained commercial interest in a work. See also Sanjiv D. Sarwate, *Rescuing Orphan Works: An Analysis of Current Legislation*, 26 IPL NEWS 21, 22 (2008) (citing a study by the Congressional Research Service, which found that for works older than fifty-five years, only two percent continued to generate revenues for owners. Therefore, “[t]he remaining 98 percent with (presumably) no commercial value to the copyright owners remain under copyright, discouraging their use by others, even when that use might have a public benefit”).

128. Pallante, *supra* note 126, at 1419.

129. *Id.* at 1421.

130. Berne Convention for the Protection of Literary and Artistic Works, art. 5(2), July 24, 1971, 25 U.S.T. 1341, 828 U.N.T.S. 221.

131. Christopher Sprigman, *Reform(aliz)ing Copyright*, 57 STAN. L. REV. 485, 541 (2004). See also SAM RICKETSON & JANE C. GINSBURG, *INTERNATIONAL COPYRIGHT AND NEIGHBOURING RIGHTS* 323-25 (Oxford University Press 2d ed. 1987); WIPO defines formalities as “any conditions or measures—independent from those that relate to the creation of the work (such as the substantive condition that a production must be original in order to qualify as a protected work) or the fixation thereof (where it is a condition under national law) – without the fulfilment of which the work is not protected or loses protection. Registration, deposit of the original or a copy, and the indication of a notice are the most typical examples.” World Intell. Prop. Org. [WIPO], *Guide to the Copyright and Related Rights Treaties Administered by WIPO and Glossary of Copyright and Related Rights Terms* 41 (2003), <https://perma.cc/AG2M-F9AS>.

132. Note that this truly happened in the U.S. only after the Copyright Act, 17 U.S.C. (1976).

continuously available for public inspection in order that the extent and boundaries of the monopoly may be understood by the public at all times during the life of the copyright.”<sup>133</sup>

The significance of loosening formalities to the proliferation of orphan works is clear. Sprigman describes how formalities filtered works for which the creator sought copyright protection, and those for which copyright protection was not intended. Formalities also signalled the copyright status of a work to the public, providing relevant information to facilitate licensing and subsequent use. As a result, of course, they provided the basis for saying whether a work was in the public domain.<sup>134</sup> Removing the signal function has thus led to increased transaction costs for any subsequent use.<sup>135</sup> Removing the filter, however, means works attract copyright protection irrespective of whether such protection is useful or expressly sought, and accordingly imposes restrictions on what uses can be made of the works. As noted by van Gompel, one significant effect of the filter function was to enlarge the public domain.<sup>136</sup>

There has been substantial discussion around the reasons for and consequences of the abolition of formalities,<sup>137</sup> and a significant academic literature proposes ways in

133. *Washington Pub. Co. v. Pearson*, 306 U.S. 30, 48-9 (1939).

134. Sprigman, *supra* note 131, at 500-02. For example, registration (to obtain copyright protection) and recordage (during the term of protection) express that a work is copyright protected, the conditions by which you may copy, publish, perform, produce transformative material, and the party with agency to negotiate that use. *Id.* at 500. They would also indicate when works move from private ownership into the public domain. *Id.* at 501. The absence of such data diminishes the publicly available information about ownership and protection status of works to the extent that obtaining the necessary information becomes economically unviable. *Id.* at 497. “Filter” formalities, on the other hand, separate work for which the creator actually sought the protection of copyright. *Id.* at 502. That is, an author generally suffered the expense of complying with formalities on the basis of some scope for commercial exploitation of a work. With this small obstacle to commercial copyright exploitation, many works of cultural value were effectively born immediately into the public domain. *Id.* at 502. The abolition of formalities interrupted this dynamic. *Id.* at 502.

135. Daniel Gervais and Daniel Renaud have argued that the “formality-free copyright subjects all works to protection, not simply those that the Creative Clause seeks to encourage, creating a situation where routine activity may lead to the creation of copyrighted works (e.g. common business email) and to copyright infringement (copying of that email), and where copyright may even be exploited as a tool of censorship (e.g., by enjoining the posting of the email).” Gervais & Renaud, *supra* note 114, at 1475.

136. “If the law would require authors and rights owners to supply adequate identifying information (e.g., in a public record or on the copies of their works) and to keep this information up-to-date, then users and third parties would be able, by inquiry, [sic] find the relevant copyright owners to arrange permission, if needed. Furthermore, it would be easier to calculate the term of protection of works if reliable information about the author were available (given that, in most countries, this term is ordinarily calculated from the date of death of the author). Enhancing the free flow of information by enlarging the public domain is an objective of an entirely different kind. The main goal is to ensure that works that do not merit copyright protection – at least not for the full term of protection – fall into the public domain and are easily recognisable as being unprotected, so as to allow anyone to freely use or build upon them.” Stef van Gompel, *Copyright Formalities in the Internet Age: Filters of Protection or Facilitators of Licensing*, 28 BERKELEY TECH. L.J. 1425, 1432 (2013).

137. Sprigman, *supra* note 131, at 544 (discussing how the overarching principle of the Berne Convention was to provide protection to authors whose work would be published in multiple countries by removing the requirements of complying with mandatory formalities in every jurisdiction of publication);

which pseudo-formalities could be re-introduced in order to overcome the market failures generated by the absence of formalities.<sup>138</sup> Most authors exploring the reformalization of copyright focus on reintroducing “signal” style formalities in order to facilitate commercial licensing of in-copyright works,<sup>139</sup> rather than as a way of enhancing the public domain.<sup>140</sup> Van Gompel suggests that an enlargement of the public domain would require “constitutive or maintenance formalities,” which are incompatible with the Berne Convention.<sup>141</sup> Alternatively, our proposal generates an enlargement of the public domain through the registry function, avoiding any challenge to international obligations.

An orphan works registry like the one we propose imposes no registration requirement on copyright owners. The data registered on the orphan works blockchain is a record of the searches undertaken to locate the owner of a work, and is thus better described as system measuring the appropriateness of a permission-free use, rather than a system requiring authors to register copyright. It is therefore a forum through which efforts to locate a rights holder are recorded. Its primary legal significance bears on the question of the diligence of a search for an owner, not the subsistence of copyright. Its secondary legal significance relates to the satisfaction of an orphan works exception or licensing mechanism, but this does not necessarily require copyright owners to register to avoid their works being deemed orphaned. The register is therefore merely a forum for the use of certain works, not for copyright subsistence or ownership. Whether the forum communicates, or indeed defines, copyright status would depend on the legal architecture behind the system. Accordingly, we cannot see how such a registry, even one that participated in the granting of a use right, would contravene international obligations.

Nevertheless, such an approach still requires legal reform to vindicate any right to use a work. As noted, we are not prescriptive to the contours of any particular orphan works regime. However, the proposed technical architecture does strike us as more amenable to certain legal mechanisms than others. Further, we believe

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Gervais & Renaud, *supra* note 114, at 1462-64 (arguing that the abolition of formalities was a triumph of a “natural rights” justification of copyright over its prior, more utilitarian, inclinations).

138. See generally Dennis W. K. Khong, *Orphan Works, Abandonware and the Missing Market for Copyrighted Goods*, 15 INT’L J.L. & INFO. TECH. 54, (2007); Joshua O. Mausner, *Copyright Orphan Works: A Multi-Pronged Solution to Solve a Harmful Market Inefficiency*, 12 J. TECH. L. & POL’Y 395 (2007).

139. Van Gompel’s approach includes requiring compliance with formalities at a later point in time than the point of obtaining copyright protection, “thus requiring rights owners to take affirmative steps to prevent their works from passing into the public domain.” These “new-style” formalities include requirements like metadata tagging of digital works, storage of rights management information in digital depositories, or any other digital tool that creates a link between rights owners and their works. There are other similar proposals, for instance Lawrence Lessig’s idea that owners be required to place their works in a copyright registry or be subject to a compulsory default license with low royalty rates, and Sprigman’s proposal for introducing nominally voluntary but de facto mandatory formalities like registration, notice, and recordation, where non-compliance results in an irrevocable “default license” with low royalties. Sprigman, *supra* note 131, at 555.

140. Gervais & Renaud, *supra* note 114, at 1486.

141. Van Gompel, *supra* note 136, at 1440.

certainty of the technical architectures is important for users. As a result, in the section that follows, we propose that the legal architecture underlying a blockchain solution should be one of existing *ex ante* approaches.

### C. LEGAL MECHANISMS FOR ORPHAN WORKS

#### 1. Limited Liability

Limited liability is an *ex post* solution for orphan works, where injunctive relief is restricted, and liability is limited to a license fee if an adequate diligent search is performed before the use. In the case of a dispute, a court is generally tasked with verifying the diligence of a search, or setting a license fee in the form of damages.<sup>142</sup> If this is the preferred legal architecture, a blockchain orphan works search registry would have substantial evidential utility to deal with the imposition of liability in the event of a dispute. The diligence of a search is made much easier by a canonical register of searches, allowing the parties as well as the judge or jury to assess the nature of the search.

In our opinion, however, having the use of an orphan work vindicated only after judicial verification of the quality of search—that is, an *ex post* approach—fails to afford the certainty necessary for commercial uses. Similarly, pursuing litigation becomes a transaction cost that is likely to be higher than the available remuneration for licensing.<sup>143</sup> Using a blockchain orphan works registry exclusively for evidential purposes in case of a dispute also fails to take advantage of some of the more sophisticated possibilities afforded by the technology. Limited liability approaches also offer reduced oversight of search diligence, at least until litigation. Burdening the courts this way not only involves substantial administrative costs, but also leaves the vast majority of uses—and therefore diligent searches—unverified, and means that the definition of orphanhood will remain blurry and *ad hoc*. In other words, the definition of an orphan becomes problematically softened when left to self-regulation. The value of an automated system and registry is that administrative functions can be finalized prior to litigation, providing certainty. This will result in substantial administrative savings that, in the case of limited liability approaches, would otherwise have to be absorbed by the courts.

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142. See David B. Sherman, *Cost and Resource Allocation Under the Orphan Works Act of 2006: Would the Act Reduce Transactions Costs, Allocate Orphan Works Efficiently, and Serve the Goals of Copyright Law?*, 12 VA. J.L. TECH 4, 1 (2007). Monetary relief is generally limited to “reasonable compensation,” and there is generally no possibility of statutory damages, attorney’s fees, or injunctive relief unless the search for rightsholder was done in bad faith.

143. See Darrin, Keith & Henning, *supra* note 117, at 212; see also Ryan Andrews, *Contracting Out of the Orphan Works Problem: How the Goggle Book Search Settlement Serves as a Private Solution to the Orphan Works Problem and Why It Should Matter to Policy Makers*, 19 S. CAL. INTERDISC. L.J. 97, 113 (2009).

## 2. Copyright Exceptions

An alternative approach to limiting user liability is to allow specific orphan work use through copyright exceptions. Ordinarily these require a good faith diligent search to be performed and verified by a bureaucratic body. The European Orphan Works Directive affords one example of what such an exception would facilitate.<sup>144</sup> However, that exception is narrowly framed, and is applicable only for cultural institutions and for non-commercial purposes.<sup>145</sup> It has been suggested that allowing commercial uses of orphan works might create “a loophole for bad actors to exploit, without any benefit to visual arts creators and owners in terms of increased licensing,”<sup>146</sup> and require significant expense in using private registries for protection.<sup>147</sup> However, the US Copyright Office’s 2015 report on orphan works argued that the distinction between commercial and non-commercial uses cannot realistically be maintained.<sup>148</sup> More than this, any holistic approach needs to consider the orphan works problem as broader than issues around mass digitisation, and the political landscape appears to have already shifted accordingly. Commercial uses of orphan works are as politically significant as cultural uses. Today, a large amount of new content is the product of transformative use and is the source of substantial originality, yet “much of our cultural raw material is outside the reach of creators because of the orphan works problem.”<sup>149</sup>

As discussed above, a blockchain based orphan works registry could afford evidential clarity for the diligence of any particular search, as in the case of limited liability systems. However, unless the exception applies to commercial uses, there is unlikely to be sufficient incentive to populate the orphan works registry. Therefore, as part of our proposal, we would broadly support the extension of exceptions into the commercial arena.

## 3. Statutory Compulsory Licensing

Statutory compulsory licensing of copyright works has existed since the middle of the nineteenth century.<sup>150</sup> It is generally understood as “plot[ting] a midway course between an exclusive right and a free exception.”<sup>151</sup> The interference with

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144. Gervais & Renaud, *supra* note 114.

145. *Id.*

146. ORPHAN WORKS AND MASS DIGITIZATION, *supra* note 64, at 52 (referring to Illustrators Partnership of America, Initial Comments Submitted in Response to Notice of Inquiry 77 Fed. Reg. 64555 (Feb. 4, 2013) at 20 (“By defining millions of copyright works as orphans on the premise that some *might* be, previous bills would allow Internet content providers to build financial empires by harvesting the work of others, providing their databases with content they could never create themselves nor acquire from authors without having to pay for it.”)).

147. *Id.*

148. *Id.*; Vuopala, *supra* note 4.

149. Brito & Dooling, *supra* note 50, at 76.

150. See David J. Brennan, *First Compulsory Licensing of Patents and Copyright*, 17 LEGAL HIST. 1, 4 (2017).

151. *Id.* at 1.



property rights achieved by compulsory licensing is generally justified on the basis of avoiding copyright being used to prevent material reaching the public.<sup>152</sup> Compulsory licensing for orphan works ordinarily involves administrative bodies verifying the quality of a diligent search that is performed by an applicant. A verified search, coupled with a determination on appropriate license fee typically results in a non-exclusive license for use. Fees are generally held in escrow for an established period of time in case the rights holder emerges.

The need to satisfy the public has resulted in numerous compulsory licenses of varied efficacy and utility. In 1866, the United Kingdom implemented the first license of this kind anywhere in the world,<sup>153</sup> although it was repealed 70 years later without a single application.<sup>154</sup> This historical example of underuse is not an anomaly: the vast majority of compulsory copyright licenses in every jurisdiction have been underused—a fact that continues to this day—and compulsory licenses for orphan works are barely, if ever, applied for. For example, compulsory licensing for orphan works has been in place in Canada since 1988,<sup>155</sup> and is now in Japan, Korea, Hungary and the UK.<sup>156</sup> All of these systems are notoriously underused. The Canadian Copyright Board administers licenses when “the Board is satisfied that the applicant has made reasonable efforts to locate the owner of the copyright and that the owner cannot be located.”<sup>157</sup> An analysis of that licensing regime offered dreary

152. David Brennan cites a first reading speech from a UK 1910 Bill that nicely summarizes the rationale. “But in order that the public may be protected from any possible abuse, the Bill will provide that after the death of the author, if the work is withheld from the public, or too high a price is charged for copies or for the right to perform, so that the reasonable requirements of the public are not satisfied, a licen[s]e may be granted to an applicant to publish or perform the work.” 19 Parl Deb HC (1910) col. 1949 (UK). See Brennan, *supra* note 150, at 24.

153. Brennan, *supra* note 150, at 8.

154. *Id.* at 10. The first, proposed in 1837, and addressing concerns that extended copyright terms post mortem, permitted compulsory reprints for out of commerce literary works, although only after a notice had been given to the rights holder. Brennan, *supra* note 150, at 14. Brennan identifies how the political rhetoric in support of the license deployed fears that pirates would inevitably produce infringing copies of non-available texts if the ability to control publication was passed on to heirs, Brennan, *supra* note 150, at 14. The result was a compulsory license available during the post-mortem copyright term, with jurisdiction vested in the Judicial Committee of the Privy Council, to prevent the suppression of important books. Other rationales in the United Kingdom for compulsory licensing identified by Brennan include addressing unauthorized importation in colonial jurisdictions (like the U.S.) of foreign reprints by (very unsuccessfully) introducing a importation customs duty to be paid to authors. *Id.* at 17-18. When a similar regime was proposed and rejected in Canada in 1872, a British Royal Commission even explored the possibility of a generalized system of compulsory licensing (a “royalty” system) as a possibility of replacing the exclusive “proprietary” rights associated with copyright. *Id.* at 18. Different levels of government have also endured the jurisdiction of administering compulsory licenses, including (in the U.K.) Office of the Lord Chancellor, the Privy Council, specific “Trade Boards,” and the comptroller of patents, designs and trademarks.

155. Copyright Act, R.S.C. 1985, c. C-42, s. 77 (Can.).

156. See Chosakuken-Ho [Copyright Law], Law No. 48 of 1970, art. 67, 74 (Jap.); see also Copyright Act of Korea, No. 9785 (2009) (S. Kor.); Copyright (Amendment) Act, 2012, No. 13 at para. 17, Acts of Parliament, 2012 (India), available at <https://perma.cc/52YT-HZ9S>; Copyright Designs and Patent Act 1988, c 48 s. 116A (Eng.).

157. Copyright Act, R.S.C. 1985, c. C-42, s. 77 (Can.).

results,<sup>158</sup> with only 230 licenses granted in a twenty-year period. The results suggest centralized compulsory licensing, administered by an entity like the Canadian Copyright Board, tasked with verification of the quality and diligence of searchers for copyright owners, is thus unlikely to achieve substantial liberation of orphans.

It seems that the bureaucratic cost of centralized compulsory licensing renders it relatively ineffective. Requiring a potential licensee to first undertake a diligent search, and then to have the quality of that search verified by a central agency, is duplication of expensive work.<sup>159</sup> Of course, the licensing body itself also needs to be established and administered.<sup>160</sup> Further, intervening against the market with centrally determined licensing fees has always been a controversial dimension of compulsory licensing. For instance, the US Copyright Office rejected this approach on the basis that it considered a government agency determining a licensing fee rather than private parties participating in the market as inappropriate.<sup>161</sup>

Antithetically, there are arguments that compulsory licensing with fixed prices is more efficient than relying on parties to negotiate prices, because “if buyers could determine the licensing fee *ex ante*, they would be more willing to expend the search effort.”<sup>162</sup> There are also persuasive arguments as to whether licensing fees for orphan works should be paid at all. Some argue that paying royalties even when an owner remains missing might constitute a disincentive for such a system.<sup>163</sup> There is also the issue that users must pay a fee even if no identifiable owner subsequently comes forward. Further, a number of scholars suggest that compulsory licensing is problematic because it only addresses owners’ economic concerns, not their desire to preserve the integrity of their work or their own reputation.<sup>164</sup> That said, there are few commercial orphan works proposals that do not affect the capacity of owners to maintain total control over use and distribution of works. Additionally, licensing fees may make commercial uses of orphan works more palatable.

Irrespective of any position taken on the pricing issue, the technical architecture for a blockchain register that we propose could address both the controversy around use of licensing fees, as well as the bureaucratic expense of compulsory licensing. With respect to licensing fees, smart contracts on a blockchain could operate as an

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158. Jeremy De Beer & Mario Bouchard, *Canada’s ‘Orphan Works’ Regime: Unlocatable Copyright Owners and the Copyright Board*, 10 OXFORD UNIV. COMMONWEALTH L.J. 215, 243, (2010).

159. Hansen et al., *supra* note 76, at 41.

160. *Id.* at 42. “By way of illustration of these significant costs, the UK Intellectual Property Office has estimated the costs of its new system as follows: The cost to users of conducting diligent searches for individual uses of orphan works would be E31 m to E122m p.a.; the cost of establishing the new authorizing body would be E2.5m (for establishing a registry or database of licensed orphan works) to £10 m (for establishing a new body with regulatory functions that could determine whether suspected orphan works could be used under license); and the costs of operating the new authorizing body would be £0.5m to £1.8m p.a.”

161. ORPHAN WORKS AND MASS DIGITALIZATION, *supra* note 64, at 94-97.

162. Hal R. Varian, *Copyright Term Extension and Orphan Works*, 15 INDUS. AND CORP. CHANGE 965, 972 (2006).

163. Brennan & Fraser, *supra* note 107, at 13.

164. Marc H. Greenberg, *Reason or Madness. A Defense of Copyright’s Growing Pains*, 7 J. MARSHALL REV. INTELL. PROP. L. 1, 13 (2007).

escrow, with a licensing fee paid into the contract to be distributed to an owner if they subsequently come forward. Alternatively, a smart contract implementation could automatically return the licensing fee to the licensee after a specified amount of time.

With respect to the administrative cost of verification, the expert system which we propose could include a threshold of search diligence that would produce an automated definition that a work is orphaned. This would mean that the verification of diligence, which is the general precondition of a compulsory license, would be performed by the technical infrastructure of the system, not by a government body, functionary, or CMO. This would create a disintermediated and automated verification of a diligent search by a technical architecture. Guidance on the specific databases and repositories that must be searched for in order for a search to be deemed diligent are already provided in certain jurisdictions and there are various regulatory and legislative approaches to outlining what is required for such a search.<sup>165</sup> Defining orphanhood through an automated mechanism would require legal reform giving significance to that exercise in automated decision making. However, the blockchain infrastructure could then adopt greater legal significance, as the act of registration would vest the use right in the public, and deliver a work into orphanhood, and potentially into the public domain. This would overcome the administrative expense of traditional compulsory licensing using an automated and transparent technical system.

#### 4. Voluntary and Mandatory Extended Collective Licensing

Extended collective licensing, a Nordic concept,<sup>166</sup> was part of the latest orphan works proposal from the US Copyright Office.<sup>167</sup> Under “voluntary” collective licensing, owners register their works with a CMO, who subsequently licenses use of the work for a pre-determined fee, and distributes royalties accordingly. This saves the user from having to find and negotiate with the owner directly. CMOs are generally specific to a genre of work: for example, in the US, the Harry Fox Agency

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165. Under the Enterprise and Regulatory Reform Act, 2013, 6, c. 24 (Eng.), the U.K. government has powers to enable licensing of orphan works in the UK for commercial and noncommercial use. The licensing scheme has been implemented through The Copyright and Rights in Performances (Licensing of Orphan Works) Regulations, 2014, No. 2863 s. 4 (Eng.), which states that a diligent search must comprise a reasonable search of the relevant sources to identify and locate the right holder. The relevant sources under 4(3) of the Regulations that must be consulted for all diligent searches are: The orphan works register for the UK licensing scheme, The OHIM orphan works database, and the appropriate sources under Part 2 of Schedule ZA1 of the Copyright Designs and Patent Act, 1988, c. 48 (Eng.). This guidance for potential applicants is provided for under 4(4) of the Regulations and provides an aid to conducting a diligent search. It explains what is involved in a diligent search and what to consider in advance. The guidance includes details on the relevant sources that applicants must consult, provides a non-exhaustive list of additional sources, and explains how an applicant must submit their evidence to the authorizing body which is the UK Intellectual Property Office (“IPO”).

166. Terese Foged, *Licensing Schemes in an On-Demand World*, 32 EIPR 20, 21 (2010). See also Hansen White Paper, *supra* note 76, at 46.

167. ORPHAN WORKS AND MASS DIGITALIZATION, *supra* note 64, at 7.

is the largest CMO for licensing “mechanicals,” which are licenses to rights in musical compositions for uses like covers or ringtones. Similarly, ASCAP, BMI and SESAC license public performance of sound recordings. CMOs emerged as technological developments that made it difficult for individuals to monitor and enforce their own rights.<sup>168</sup>

Extended collective licensing “extends” a CMO’s license administration regime to non-members. Those non-members are content owners who have not voluntarily signed up with the CMO. The scheme operates through the legal artifice of deeming all creators of a certain type of work under the purview of a CMO if a certain percentage of creators are members. The critical mass of membership is taken to represent the likely intention of non-member creators. According to the US Copyright Office, the rationale for extended collective licensing is the promotion of uses of content “that are considered socially beneficial but for which the costs of obtaining rights on an individual basis may be prohibitively high.”<sup>169</sup> The primary difference from compulsory licensing is that royalty negotiation is performed by the CMO ostensibly on behalf of its members, rather than by a government or other centralized body.<sup>170</sup>

The potential for extended collective licensing to assist with orphan works is clear. Users can obtain licenses for works of a particular type from a CMO without having to search for a rights holder, and the license terms negotiated between rightsholders and the CMOs are “extended” to rightsholders of the same class, overcoming issues of governments setting royalty fees. When orphan works are licensed, the CMO spends a percentage of the licensing fee searching for the rights holder and pays itself a certain amount for administration. Like limited liability approaches, the definitional quality of a verified diligent search is abrogated in favor of faith in a private operator to act appropriately under the auspices of a statutory prescription. Claims to remuneration by a rights holder that subsequently emerges are therefore against the CMO, not the user.

Criticisms of extended collective licensing include the removal of economic imperatives to actively connect owners and users, and therefore expose license negotiations to free market conditions, as absent rights holders become bound by statute.<sup>171</sup> This upends traditional copyright principles because it applies to works and rights holders *other than orphans*. That is, it introduces permissionless licensing in situations where content owners are perfectly willing, ready and available to negotiate licenses. It also creates situations where rights holders have not agreed to be represented by the CMO. Extended collective licensing also operates in narrow domains prescribed by statute,<sup>172</sup> thus failing to produce a universal approach to

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168. Jeremy Thorpe, *Collective Licensing of Copyright: Options For Competitive Reform*, 5 AGENDA 213, (1998).

169. ORPHAN WORKS AND MASS DIGITALIZATION, *supra* note 64.

170. *Id.*

171. See, e.g., HANSEN, *supra* note 74, at 76.

172. In Denmark, where extended collective licensing is most prevalent, there are eight areas in which CMOs can grant licenses for the material of non-members: reproduction for educational use,

orphan works clearance. Similarly, such licenses may also be limited to particular types of institutions<sup>173</sup> for particular purposes rather than universal applications. Further, where they are successful, they risk producing monopolies for CMOs.<sup>174</sup>

Because a CMO must already represent a critical mass of owners of a particular class, extending a CMO's right to license where "voluntary" collective licensing is not already developed becomes a more radical idea.<sup>175</sup> Extended collective licensing has also been criticized on the basis that once a licensing fee has been paid to the CMO, the search for a true owner occurs under conditions of conflicted interest, as CMOs are often permitted to retain licensing fees if owners cannot be located.<sup>176</sup> There are now mechanisms to address that however, such as requirements around dispersal of escrowed funds to particular purposes rather than the CMO's general coffers.<sup>177</sup> Nevertheless, this remains problematic in the context of private organizations being afforded monopolies over particular classes of work through

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reproduction of descriptive articles by business enterprises for internal use for the purpose of their activities, online transfer of texts via libraries, recording and distribution of radio and television programmes for visually handicapped persons, use of works in generally informative presentations, and radio and television broadcasts. See Zijan Zhang, *Transplantation of an Extended Collective Licensing System – Lessons From Denmark*, 47 INT'L REV. INTEL. PROP. & COMP. L. 640 (2016). However, the Danish Ministry of Culture has stated that social and technological development proves a need for extended collective licensing in new areas of exploitation, including digitization and dissemination cultural heritage. Foged, *supra* note 166, at 24.

173. See Vuopala, *supra* note 4, at 47.

174. For example, the Amended Google Books settlement would have instantiated, through litigation, a de facto CMO for books in the US in the form of a "books rights registry." It is estimated the Google Book Search project has scanned over seven million texts, approximately one million from the public domain, one million with permission from publishers and five million that were out of print. Andrews, *supra* note 143, at 118-19. The "genius" of the Google Books litigation would have been its de facto change in the default copyright position from opt-in to opt-out. See Randal C. Picker, *The Google Book Search Settlement: A New Orphan-Works Monopoly?*, 5 J. COMP. L. & ECON. 383, 385 (2009). This radical step was certainly part of its undoing, as was, as Judge Denny Chin described, its provision of a de facto monopoly to Google for orphan works. The U.S. Copyright Office complained that Book Search amounted to a judicially instituted compulsory license, which should be the domain of the legislature. The report argued that only the legislature should be entitled to grant compulsory licenses and only in circumstances of market failure. The report further characterized the project as "an end-run round copyright law as we know it." *Competition and Commerce in Digital Books, Before the H. Comm. on the Judiciary*, 111th Cong. 68 (2009) (statement of Marybeth Peters, Register of Copyrights, U.S. Copyright Office); see Pamela Samuelson, *Legislative Alternatives to the Google Book Settlement*, 34 COLUM. J.L. & ARTS 697 (2011) (suggesting that the Google Books settlement agreement should not be approved). The district court ultimately rejected the negotiated settlement agreement, in part because of its treatment of orphan works. See *Authors Guild v. Google Inc.*, 770 F. Supp. 2d 666, 677 (S.D.N.Y. 2011). See also Thomas Riis & Jens Schovsbo, *Extended Collective Licenses and the Nordic Experience: It's a Hybrid but Is It a Volvo or a Lemon?*, 33 COLUM. J.L. & ARTS 471, 474-76 (2010) (reviewing the Nordic ECL model on which the Copyright Office's proposal is based).

175. See, e.g., HANSEN, *supra* note 74, at 46.

176. Stef Van Gompel, *The Orphan Works Chimera and how to Defeat It: A View from Across the Atlantic*, 27 BERKELEY TECH. L.J. 1347, 1363 (2012).

177. The Copyright and Rights in Performances (Extended Collective Licensing) Regulations 2014, S.I. 2588, art. 19 (U.K.), available at <https://perma.cc/65E5-LADR>; Alain Strowel, *The European Extended Collective Licensing Model*, 34 COLUM. J.L. & ARTS 665 (2011).

statute. It has not helped that there have been a number of examples of problematic behavior on the part of CMOs.<sup>178</sup>

Extended collective licensing and the technical architecture we have outlined are essentially incompatible. The automated platform, distributed registry and smart contracts effectively usurp the functions of a CMO. The search performed by a CMO would have to be performed by a user rather than the CMO, although an effective expert system could ameliorate any direct expense. Any pricing mechanism could be built into the blockchain with smart contracts functioning as escrow for rights holders, eliminating potential windfalls for private entities. Any money not collected could be returned to searchers or otherwise used to promulgate the system, for instance, by paying for access to non-open access content repositories for the sake of searching. And the corporate knowledge generated through administering rights would be made transparent on the registry.

### 5. Multi-Tiered Solutions

It is important to note that some jurisdictions deploy combinations of legal mechanisms to address different uses and users of orphan works. A multi-tiered approach recognizes that the expense of diligent search and administrative verification would prevent mass digitisation by cultural institutions,<sup>179</sup> but not individual, small-scale or even commercial uses.<sup>180</sup> Accordingly mass-digitization might be afforded an extended collective licensing tool, but other uses must still perform diligent search. Further, cultural institutions might not require independent administrative verification of search diligence, whereas individuals still do.<sup>181</sup> Multi-tiered approaches require difficult and slippery classifications of uses and users, including an impossible distinction between commercial and non-commercial. They also, in certain scenarios, withdraw the necessity of administratively verified diligence,<sup>182</sup> which obscures the definition and category of orphanhood. If an

178. Ariel Katz, *The Potential Demise of Another Natural Monopoly: Rethinking the Collective Administration of Performing Rights*, 1 J. COMP. L. & ECON. 541, (2005).

179. See, e.g., Hansen, *supra* note 74, at 10 (“Even if Congress does coalesce behind legislation, the leading proposal from the Copyright Office is unlikely to allow for large-scale open access to orphan works because of the administrative burdens digitizers would face in complying with search requirements and filing a “notice of use” for each work.”).

180. Sprigman, *supra* note 131, at 11.

181. See, e.g., Hansen White Paper, *supra* note 76, at 19 (“It was originally proposed that diligent searches for both tiers would be reviewed and confirmed by a new government body that would be tasked with authorizing use of orphan works. After consultation with library and publisher stakeholders, the UK government has decided that the new authorizing body will not generally validate searches done by institutions or their agents in the first tier. Instead, it will take a “regulatory” approach, accrediting institutions that want to register orphan works, and periodically testing the quality of institutions’ searches and the search process on a random sampling basis.”). See also Van Gompel, *supra* note 176, at 1349.

182. The UK Intellectual Property Office estimates that the cost to users of conducting these diligent searches would be £31m-£122m per annum and the cost of operating the authorizing body would be £0.5m-£1.8m per annum. U.K. INTELL. PROP. OFF., FINAL IMPACT ASSESSMENT ON ORPHAN WORKS 6-7 (June 2012), <https://perma.cc/37CY-KCWL>.

automated system and registry were sufficiently efficient, such differentiation would be unnecessary.

## 6. Conclusion

A technical infrastructure of expert systems, automated search and verification, smart contracts, and distributed ledgers could be the foundation for multiple legal architectures addressing orphan works. Nevertheless, the technologies demonstrate particular affordances that benefit certain orphan works clearance constructs over others. While many of these mechanisms involve a diligent search, which the proposed system would automate (or at least record the results of), the legal significance of a blockchain orphan works registry differ for each approach. For instance, in limited liability regimes, the orphan works registry is effectively an evidentiary artifact, enabling auditing of search diligence. For a copyright exception, a blockchain registry would be a suitable database technology. However, an automated system could additionally perform some of the administrative verification of search diligence. Registration of a work would both publicize that a certain work could be used under the copyright exception and provide a record of the search for owners. Under a compulsory licensing regime, the technology would perform a similar function. However, it could also support payment and escrow of a license fee. That would mean registration of a work would vest a non-exclusive license in the applicant and accordingly deliver the work into orphanhood. In the case of an extended collective licensing regime, the technology could effectively replicate the functions of a CMO under the artifice of extended jurisdiction to non-members but eliminate any profiteering by private entities for a socially useful copyright clearance mechanism.

Also discussed above is the possibility of enabling the system to automate the definitions of diligence and orphanhood and the granting of use rights. In other words, the requirements for diligence might not be prescribed in legislation or regulation to be replicated through an expert system, but rather, the legislation could specify that the search performed by the technical architecture constitutes a diligent search, giving a “legal” character to the code animating the system. This approach rejects the relationship between diligent search and the definition of orphans in any ex post, or non-administratively verified system, for instance as proposed by the U.S. Copyright Office in 2006, which adopted:

... a very general standard for reasonably diligent search that will have to be *applied by users, copyright owners and ultimately the courts on a case-by case basis*, accounting for all of the circumstances of the particular use. Such a standard is needed because of the wide variety of works and uses identified as being potentially subject to the orphan works issues, from an untitled photograph to an old magazine advertisement to an out-of-print novel to an antique postcard to an obsolete computer program. Each of these presents different challenges in trying to find a copyright owner, and what is reasonable in one circumstance will be unreasonable in another. *It is not possible at this stage to craft a standard that can be specific to all or even many of these circumstances.* Moreover, the resources, techniques and technologies used to investigate the status of

a work also differ among industry sectors and change over time, making it hard to specify the steps a user must take with any particularity.<sup>183</sup>

An effective, universal, and legally significant system rejects the claim that “[i]t is not possible . . . to craft a standard that can be specific to all or even many of these circumstances.” The approach in some European jurisdictions, including the use of comprehensive checklists and regulations expressing the character of a search that would subsequently be verified as adequate by an administering body, already suggests movement away from the generalist definition. If diligent search is to be the definitional criterion of an orphan work, verification becomes a crucial element of the bureaucratic technology of that definition. Indeed, the compulsory licensing model discussed above generally includes verification mechanisms that contributed to their inefficiency, resulting in some cases in a devolution of that process into mere administrative oversight and auditing. However, a technical system might push these verification mechanisms out of administrative or bureaucratic entities and into the technical infrastructure itself.

This would render the technological platform more than merely an exercise in “E-Government” or a novel use of ICTs to “improve” public sector organizations. It goes beyond merely facilitating transactions between publics and governing bodies. Rather, it represents the performance of specific administrative tasks by a technological system, including the automation of administrative and legal decision making and the vesting of legal rights with reduced human oversight.

Our blockchain-based approach thus devolves an administrative process into an automated technological structure. The blockchain is certainly not a technology specific to intellectual property, nor is it even simply an efficiency enhancing technological innovation. Rather, as Potts, Davidson, and de Filippi argue, the true value of distributed ledger technology is as an institutional innovation, a technology of economic coordination and governance.<sup>184</sup> It is precisely as a new institutional form and coordination mechanism that makes blockchain a useful technology for addressing orphan works. It is the logic of coordination and consensus building associated with the blockchain that enables the verification, issuance and registration of licenses through an automated technical structure. While automated administrative decision making and legal expert systems are nothing new, the blockchain architecture and the automation of registration raise novel questions related to the automation of legal processes.

Trying to formulate an understanding of these institutional changes, even in a relatively peripheral area like orphan works, requires acknowledging a breakdown of the traditional distinction between technology and law. Legal scholars must be alive to the questions of what it means to have a technical system that is written in a language that a lawyer may not understand but which produces legal definitions and legal actions. Relocating institutional agency to the level of engineers and designers who produce the technologies would upend the traditional hierarchy of the law.

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183. U.S. COPYRIGHT OFF., REPORT ON ORPHAN WORKS 9 (2006) (emphasis added).

184. Potts et al., *supra* note 32.



Lawyers, bureaucrats, and administrators would no longer be the arbiters of legal process. Instead, control would pass to engineers and designers. The long term effect of this is not well-understood, and unpacking this problem is a topic for another day.

However, we should be aware of what we are doing when we insert technology into the legal process. Replacing an administrative body with a technical platform should only be done with an understanding of what it means to delegate legal decision making into pre-determined design parameters. Such an approach will inevitably have consequences for transparency and autonomy. In articulating and promoting an automated orphan works clearance system in this article, we are making the assessment that the technical system will on average produce outcomes of sufficient desirability to mollify any negative consequences associated with transformed institutional structures. Nevertheless, we recognize that as a society we need to move towards these new forms of institutional governance and decision-making with a clear understanding of the risks. We cannot afford to be blinded by the shiny surface of our new technological playthings.

#### IV. CONCLUSION

Despite substantial effort, the orphan works problem has hardly disappeared. This Article examines the possibility of using distributed ledgers, in combination with artificial intelligence techniques for automating diligent search, to further facilitate use of orphan and public domain works. The system proposed here is intended to enhance existing “diligent search” expert systems by introducing a publicly available and auditable registry of all searches undertaken for a rights holder. Addressing orphan works with registry-based solutions is not a new idea.<sup>185</sup> However, the specific affordances associated with blockchain ledgers offers advantages not available in more traditional registry structures. Whereas existing orphan works registries provide entries for works already deemed orphaned, the blockchain-based system we propose does not merely record administratively-verified orphan works for the purpose of avoiding search duplication, but rather becomes part of the mechanism that delivers a work into orphan status. We have outlined a range of ways in which a blockchain-based register might become a part of the solution. It might be through the simple mechanism of providing data to audit the diligence of a search or through a sophisticated mechanism where the registry itself generates a definition of “diligence.” The blockchain solution might be enhanced by changes in the law that actively vest a public use right in an orphan work via a Torrens-style register. In even more sophisticated mechanisms, an orphan work use right could be written as a “smart license” that executes certain functions over the orphan work. Whatever mechanism is selected, our primary claim is that the logics of coordination and consensus building associated with blockchain are highly useful for enabling the

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185. Lessig has suggested introducing a system similar to registering internet domain names, the idea being that competition between competing registration systems leads to a race to the bottom regarding ease and cost of registration. Lawrence Lessig, *For the Love of Culture*, NEW REPUBLIC (Jan. 26, 2010), <https://perma.cc/5GSK-H6P8>. However, we think an established universal solution has more utility.

verification of diligent search, as well as the issuance and registration of an orphan works use right, with an automated technical system.

The various options for technical architectures suggested above each require different legal architectures to make best use of the affordances of distributed ledger technology. As noted, this might be as simple as an immutable register of searches that can be audited or as complex as using automated decision making systems to transfer rights. With each approach, we argue above that the technology could overcome certain economic barriers to the performance and verification of diligent search, as well as communication to the public of the use of certain works. We further believe that use of a public registry could provide a socially useful function without including any profiteering associated with private copyright management, as has been argued is a feature of CMOs.<sup>186</sup>

The goal of this Article, therefore, is not to prescribe the specificities of any orphan works clearance mechanism. Instead we have sought to outline the new technical architecture and legal infrastructures which might resolve the orphan works problem. In doing so, we hope to contribute to the discussion of intellectual property registration by prompting next-generation solutions for liberating use of orphan works. While our proposal is shaped around orphan works issues, there is also scope for extending the idea to the management of other categories of content such as out-of-commerce works,<sup>187</sup> light-permission works, or public domain works.

Beyond copyright management, blockchain technologies are likely to play an increasingly prominent role in asset management and government services generally. For instance, real property registration has been a suggested use case for distributed ledgers from early in their development.<sup>188</sup> Although some have criticized the use of blockchain approaches for government registration services because they often employ private or permissioned blockchains, we believe distributed ledgers do not need to have proof of work mechanisms and digital currencies to be desirable and useful.<sup>189</sup> Private and permissioned ledgers are increasingly using other mechanisms for consensus and integrity.<sup>190</sup> Further, the system we have suggested is not a private ledger available only to particular persons. The search audit data recorded on the orphan works / public domain blockchain is only useful when it is fully public and available. In certain respects, the registry element of the proposed system is a type of “open data” mechanism. This is because the technology enhances the crucial dimensions of a government register, being verification, trust, and public availability.

Accordingly, in the next few years, many government registration functions are likely to be disintermediated into technical platforms, with the automation of those

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186. See, e.g., Jonathan Band & Brandon Butler, *Some Cautionary Tales About Collective Licensing*, 21(3) MICH. ST. INT'L L. REV. 689 (2013).

187. AUSTL. PRODUCTIVITY COMM'N, *INTELLECTUAL PROPERTY ARRANGEMENTS* (2016), available at <https://perma.cc/D39E-XJBH> (suggesting that OOC and OW be treated similarly).

188. Staples M. et al., *Risks and Opportunities for Systems Using Blockchain and Smart Contracts*, DATA61 (CSIRO) (May 2017), <https://perma.cc/F62V-BZBJ>.

189. *Id.*

190. *Id.* at 18.

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platforms offering distinct efficiencies over human bureaucratic administration. Our proposal for orphan works is merely one of the many ways in which we see automated systems taking over legal processes. In the future, we anticipate the institutional logic of blockchain as being highly influential on the changing mechanics of governance.