DISCUSSION

A Conversation on Art, Museums, and Blockchain

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I. INTRODUCTION

This Discussion is a written culmination of a series of talks that took place in the summer of 2018 between Rachel Wright, culture advocate and entrepreneur, and Stan Sater, 2019 J.D. candidate. The talks were the result of two individuals sharing a common goal and a question: is there an opportunity to create greater access to the world's museum collections with blockchain technology?

Museums are places that bring people together from all walks of life to explore, consume, and interact with all types of curated art. These interactions don't always take place within the walls of a museum. Instead, people may access art and exhibitions through other mediums, such as the Internet, via publications and consumer products. Museums extend their reach with licenses that grant the right to reproduce images of artwork in their collections and utilize data sets about the works

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themselves. We see the opportunity for data sharing between museums moving their historical records to a distributed ledger backed by blockchain technology. In this format, ownership and copyright data will be complete and shared among cultural institutions and the public facilitating greater access, exploration, and connection of cultural objects and works of art. This Discussion is a conversation on why we see the possibility from a personal perspective and is a broader debate on questions worth addressing individually.

II. A QUICK HISTORY OF ART LICENSING

There are approximately 55,000 museums around the world.[1] Together, these museums own millions of works of art or other works of authorship, which may be entwined with the intellectual property rights of creators and subjects. Alongside these works of art exists an ecosystem of artists, scholars, curators, and collectors with personal, professional, and economic relationships. This interdependence results in a network of people encouraged to seek permission from one another, develop and maintain strong relationships, and proceed with caution when requesting or granting permissions for object loans, publications, and reproductions.[2]

Beyond the ecosystem of art and museum professionals, museums also work to make their collections more available to the general public, including editorial publishers and commercial producers of apps, ad campaigns, and consumer products. In an effort to streamline licensing permissions and increase distribution of a collection, museums and their licensing departments may decide to utilize two separate approaches: (1) sublicensing portions of their collection to professional image-licensing companies to redistribute and negotiate licenses on their behalf, and (2) initiatives for open access to public domain works.

As early as the 1950s, image-licensing companies such as Scala, Art Resource, and Bridgeman Images built businesses to facilitate the licensing of images of works of art for professional reuse by editorial publishers, commercial advertising, and consumer products. Today, when combined, they represent hundreds of museums who agree to let the "image aggregator" negotiate licenses on behalf of the museum in

1. DE GRUYTER SAUR, MUSEUMS OF THE WORLD 2017 (24th ed. 2017).

2. PATRICIA AUFDERHEIDE ET AL., COPYRIGHT, PERMISSIONS, AND FAIR USE AMONG VISUAL ARTISTS AND THE ACADEMIC AND MUSEUM VISUAL ARTS COMMUNITIES: AN OPEN LETTER FROM THE COLLEGE ART ASSOCIATION 36-37 (2014), http://www.collegeart.org/pdf/FairUseIssues Report.pdf.

exchange for a percentage of the revenue generated by the license.[3] However, museums are unable to outsource the job of image licensing to these aggregators entirely. A majority of the licensing requests museums receive cannot be completed without museum representatives sorting through donation or acquisition agreements tied to the original object, or by tracking down the approval of museum curators. In some cases, a museum may own the work of art, but not the copyright, and may decline a license request until the copyright owner has been contacted and has approved their own reuse request. Sometimes the museum will contact the copyright owner to manage the approval; other times the requestor must begin the search to contact the copyright owner. Without an efficient means of linking owners, rights holders and approval records, it is difficult to verify approved licenses.

Alternatively, some cultural institutions create open-access policies for images of their public domain art works or release historical data sets about the objects and artists in their collection. In the United States alone, the Metropolitan Museum of Art (the Met), the Museum of Modern Art (MoMa), J. Paul Getty Museum (the Getty), National Gallery, and the Smithsonian Museums will release imagery and data sets for anyone to use, for free, via Creative Commons licenses. For example, a software developer may download all the collection data from MoMA on Github and remix it with the data from the Cooper-Hewitt, or a designer may download ultra high resolution images of public domain works from the Getty or the Met, free for any use.

Unfortunately, for those seeking to acquire a license online, they may find conflicting information between a museum's licensing policy and the images available from image aggregators. For example, imagine a work is released on a museum's website as an open-access image, and a second, digital reproduction of that same work is released on an authorized licensing aggregator's site requiring a fee for use. *Which license is correct?* Alternatively, a museum website may restrict all content, but a person not associated with the museum publishes a photo of the same work of art on a website such as Flickr with a Creative Commons license and no restrictions. *Am I really okay to reuse this image?* For individuals

3. *Famous Museums, Monuments & Archives*, ART RESOURCE, http://www.artres.com/CS.aspx?VP3=CMS3&VF=ARTHO1_4_VForm&Flash=1&FRM=AboutUs_MainMenuContent:ARTHO1_13 (last visited Feb. 19, 2019); *The Scala Picture Library—a Superb Fine Art Collection*, SCALA ARCHIVES, http://www.scalarchives.com/web/presentazione.asp (last visited Feb. 19, 2019); *Bridgeman Copyright*, BRIDGEMAN IMAGES, http://www.bridgemanimages.com/en-US/about-bridgeman/US (last visited Feb. 19, 2019).

seeking to reproduce or remix works across these collections, it means confusion and frustration. Without a clear "source of truth" there is a perceived risk in reuse of the content. Few people wanting to reproduce or remix works have the time, patience, legal expertise, or access to documentation required to try to trace the rights and to reuse terms from the world of fine art and museums.

III. A QUICK HISTORY OF BLOCKCHAIN

Blockchain is a system that allows for global, tamper-proof recordkeeping.[4] In 2015, *The Economist* described blockchain as "the great chain of being sure about things."[5] Participants can see all of the assets recorded on the blockchain ledger, as well as related transactions and terms of use. "Blockchain technology provides a new platform for creators of intellectual property to get the value they create. . . . The technology solves the intellectual property world's equivalent of the double-spend problem better than existing digital rights management systems."[6]

In 2008, Satoshi Nakamoto, an anonymous individual or group of individuals, developed blockchain as a technology that underlies Bitcoin.[7] It solves the double-spend problem that plagued previous peer-to-peer (P2P) digital money attempts.[8] We encounter the double-spend problem everyday without noticing that it is a problem. For transactions done with physical cash, it is easy to prove that if Alice gave Bob twenty dollars, Alice cannot give someone else the same twenty dollars. For digital transactions (ie., credit cards, debit cards, wire transfers, and other electronic payment options like Venmo), we trust some third-party institution to verify the transaction and prevent Alice from using the same twenty dollars for two different transactions. Now, with blockchain technology, we can remove the intermediated, tamper-prone third parties and verify that people are transacting honestly with one another.[9]

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4. SERHACK, MASTERING MONERO: THE FUTURE OF PRIVATE TRANSACTIONS 16 (2018).

5. *The Great Chain of Being Sure About Things*, ECONOMIST (Oct. 31, 2015), http://www.economist.com/briefing/2015/10/31/the-great-chain-of-being-sure-about-things.

6. Don Tapscott & Alex Tapscott, *The Impact of the Blockchain Goes Beyond Financial Services*, HARV. BUS. REV. (May 10, 2016), http://hbr.org/2016/05/the-impact-of-the-blockchain-goes-beyond-financial-services.

7. Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System,* BITCOIN.ORG (2008), http://bitcoin.org/bitcoin.pdf.

8. Sinclair Davidson et al., *Blockchains and the Economic Institutions of Capitalism*, 14 J. INST. ECON. 639 (2018).

9. Sinclair Davidson et al., *The Cost of Trust: A Pilot Study*, 1 J. BRIT. BLOCKCHAIN ASS'N 1, 5 (2018).

Blockchain enables a secure and transparent environment to exchange digital money and decreases the costs of doing business online through three core components: P2P networking, consensus mechanisms, and blockchain as a hash-linked data structure.[10] First, the blockchain network is P2P because a computer running the network's software (a node) directly "talks" to or "transacts" with other computers running the same software. This is not the same as a computer talking to a centralized server or centralized intermediary. Rather, every node maintains a full copy of the ledger of transactions rather than trusting a central authority like a Wells Fargo, Google, or the Depository Trust and Clearing Corporation (DTCC) to confirm the state of the ledger at any given point in time. Second, without centralized intermediaries, there must be an agreed upon set of rules to come to consensus about the current state of the ledger and what constitutes a valid transaction. These rules that determine the validity of the state of the ledger and the methods used to validate transactions are the consensus mechanism.[11] For example, Bitcoin uses proof-of-work as its consensus mechanism by incorporating miners and rewards to ensure the validity of the blockchain.[12] If one miner tries to include an invalid transaction (i.e., a transaction that breaks the rules), then other participants within the network will reject the transaction. Finally, data entries are time-stamped and cryptographically appended to the blockchain referencing the previous block creating a linked chain of data. In simpler terms, a blockchain network is a series of computers connected to a network that all come to an agreement over shared data.[13]

This ledger of transactions can be for assets native to the network (i.e., cryptocurrencies like Bitcoin native to the Bitcoin blockchain) or digital representations of another asset (i.e., tokenized assets). As cryptocurrency has entered the media hype-cycle, there has been an increase in research and development to expand blockchain, or more broadly, distributed ledger technology, as a general purpose technology capable of serving as an "engine of growth" for other industries that require lots of coordinating economic activity.[14] These developments have assisted companies in creating a secure and transparent environment so

10. Peter Van Valkenburgh, *What Is Blockchain Anyway?*, COIN CTR. (Apr. 25, 2017), http://coincenter.org/entry/what-is-blockchain-anyway.

11. *Id.*

12. *Id.*

13. *Id.*

14. *See* Davidson et al., *supra* note 8, at 639-41.

that industries that would typically require third parties to verify transactions are now able to save money and redirect those funds to increase the speed of certain operations.

IV. THE CONTEXT OF THE CONVERSATIONS

Blockchain technology offers an opportunity to link assets to multiple owners. As an example, with music, a blockchain ledger could indicate all of the various rights owners that collaborated in the creation of a song (i.e., composers, performers, and producers). When royalties are due, smart contracts can be programmed to pay each rights holder their share. Similarly, with transparent records linked across museums, people can identify the owner of the work of art, the owner of the copyright, and any other intellectual property owners. Today's museum records on the objects they own are siloed. The goal is to utilize distributed ledger technology to de-silo this data across the ecosystem. Such a technology will need to consider the needs of the individuals involved in the ecosystem and to anticipate how transparency on ownership, provenance, and reuse can incentivize their participation.

V. THE DISCUSSION

When did you first learn about blockchain?

Stan: I went down the proverbial blockchain/cryptocurrency rabbit hole shortly after finishing my undergraduate studies in political science in 2015. After graduating, I started working for a hotel-booking platform doing revenue management. Revenue management involves using data to predict customer behavior in order to optimize hotel room pricing while maximizing revenue across multiple websites. During this time, I was also applying to law schools and attempting to figure out the area of law in which I eventually wanted to practice. I have always enjoyed working in technology ever since working for a startup in undergrad, so I considered the law related to that field. Working with hotel data, I saw data privacy as an increasing area of concern with every conversation converging to the topic of big data and artificial intelligence (AI). Data privacy was also a politicized issue in Europe at the time as the General Data Protection Regulation (the GDPR) was reaching a final vote before the European Parliament.

The GDPR eventually passed in May 2016 and became effective on May 25, 2018.[15] The GDPR updated the Data Protection Directive 95/46/ec after twenty years and unified existing data protection laws across all EU Member States while also providing EU citizens with more protection and rights over their personal data collected by corporations.[16] The extraterritorial nature of the GDPR set the groundwork for other countries to adopt similar privacy frameworks and incentivize United States-based multinational organizations to improve company data practices. Around the same time, Ethereum, a blockchain protocol network, was introduced and marketed as a "Swiss army knife" blockchain protocol that was capable of storing both code and data to produce a common state of the ledger secured by the consensus rules, the block validation rules followed by nodes to stay in consensus.[17] Meaning, it had the ability to follow currency transactions and any state transitions of general data. As a smart contracting platform, Ethereum enabled the automation of more tasks along with the tokenization of multiple assets via the ERC-20 standard.[18] The possibilities seemed infinite, and I wanted to learn more.

Like most people, I initially dismissed Bitcoin thinking it could not work on a large scale and services like PayPal and Venmo worked pretty well. When I first learned about Bitcoin, it was used as the sole payment method for Silk Road, a "darknet" marketplace for illicit goods and services.[19] It was consequently shut down by the United States government in 2013. One year later, Charlie Shrem, an entrepreneur and investor, was prosecuted and sent to prison for aiding in an online company's unlicensed money transmission.[20] That same year, one of the largest Bitcoin exchanges at the time, Mt. Gox, was hacked losing its

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15. Regulation 2016/679, of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data and Repealing Directive 95/46/EC (General Data Protection Regulation), arts. 1-3, 99, 2016 O.J.L. 119 32-33, 87-88.

16. *See generally* Paul Ohm, *Forthright Code*, 56 HOUS. L. REV. 471, 480-81 (2018).

17. Kyle Torpey, *Vitalik Buterin on His Long-Term Goals for Ethereum*, BITCOIN MAG. (May 4, 2016), http://bitcoinmagazine.com/articles/vitalik-buterin-on-his-long-term-goals-for-ethereum-1462381147/.

18. The ERC-20 standard is a standard of functions used for smart contracts on Ethereum for creating tokens. Maxwell William, *ERC-20 Tokens, Explained*, COIN TELEGRAPH (May 12, 2018), http://cointelegraph.com/explained/erc-20-tokens-explained.

19. *See generally* Andrew Norry, *The History of Silk Road: A Tale of Drugs, Extortion & Bitcoin*, BLOCKONOMI (Nov. 20, 2018), http://blockonomi.com/history-of-silk-road/.

20. Emily Spave, *Charlie Shrem Speaks Out About Mt. Gox, His Arrest and the Bitcoin Bromance*, COINDESK (Feb. 27, 2014), http://www.coindesk.com/exclusive-charlie-shrem-speaks-mt-gox-arrest-bitcoin-bromance.

customers hundreds of millions of dollars worth of Bitcoin held on the exchange.[21] I thought trust in Bitcoin would not recover, but as an open protocol, the code could be used for further developing blockchain and be applied to streamline a lot of business inefficiencies. Despite numerous news reports that Bitcoin is dead, it is very much alive.[22]

Before law school, I was planning a trip with a few friends to climb Mount Kilimanjaro in Tanzania, Africa. I was discussing a wire money transfer with one of the guides based in Arusha, Tanzania, so that he could obtain the necessary climbing permits for us. When he sent me his banking information, I was forced to take off work to visit the bank in person before it closed to wire him the money. Two bank employees made it clear that there was a fifty dollar wire fee, it would take an average of three to five business days, and warned me that the transfer could not be reversed. The transaction went through without any problems. In Tanzania, most people have Internet-connected phones, and while micro-financing shops seem to be on every street, there are very few traditional banking options for the average person. Walking around the city before and after the climb, I could see first hand how pervasive mobile wallets were over traditional banking.

The next year, I encountered another money problem when I was planning a trip to Cuba. Again, most people have Internet-connected phones in Cuba, yet they live under an authoritarian, kleptocratic regime with strict capital controls. Their wages are capped and they are unable to transfer money without the government knowing. Additionally, if a tourist needs to exchange U.S. dollars for Cuban pesos, they incur a ten percent tax. My solution to avoid the exchange tax was to exchange U.S. dollars for Canadian dollars at my bank and then convert the Canadian dollars to Cuban pesos once in Cuba. I did this currency exchange for my two friends as well as paid for the AirBnb we stayed in for the week. My friends paid me back using Venmo. However, they used the word "Cuba" in the description of the payment. Because Cuba is under U.S. trade sanctions, Venmo, as a money service business, must comply with sanctions administered by the Office of Foreign Assets Control. This meant that the transaction needed to be reviewed and my account was frozen so that Venmo could make sure my transaction activity complied with the current regulations. The transaction was reversed and fortunately my account was unfrozen after being reviewed. Both of these experiences

21. *Id.*

22. *Bitcoin Obituaries*, 99BITCOINS, http://99bitcoins.com/bitcoin-obituaries/ (last visited Jan. 31, 2019).

made the value proposition of cryptocurrencies (especially Bitcoin for financial payments) attractive. The value proposition being a 24/7/365, global, permissionless, decentralized, and trustless transaction network that settles (what should be simple) transactions in minutes for extremely low fees without third-party intermediaries.[23]

My first year of law school was disappointing. The only class I found remotely interesting was Contracts, primarily because I was referencing the developments of Ethereum and smart contracts. I started to read more closely the earlier writings of Nick Szabo, who has a J.D. degree and coined the term "smart contracts." In order to regain my initial drive to attend law school, I decided to reach out to a third-year for advice on how to pursue a study of law and technology with a focus on blockchain and data. She recommended that I meet with the school's copyright professor, Professor Elizabeth Townsend Gard. I told Professor Townsend Gard some of my goals in law school, and she brought me on to help with one of her copyright projects that involved aggregating data to solve copyright issues. This project then led me to a summer externship opportunity in San Francisco to work at the Internet Archive on a copyright project that could help put more books into the public domain.[24] I did not hesitate at the opportunity.

While in San Francisco, I attended a few cryptocurrency meetups. These meetups fueled my obsession with the topic. I was learning about the ins and outs of the technology while theorizing its various applications in the technology capital of the world. As a non-developer attending these meetups and asking questions about policy and the law, I finally felt excited about joining the legal world since entering law school. The best thing about meeting these like-minded people was the never ending discussions on cryptocurrency. Up to that point, I had never experienced such an openness and willingness to talk about a topic. Now, as my final year of law school comes to a close and I continually gain more knowledge, I realize there are even more unanswered legal questions about how this new technology will evolve and influence the real world.

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23. For example, an unknown person transferred $99 million worth of Litecoin, another popular cryptocurrency, for $0.40 in fees and it took 2.5 minutes to settle. Oscar Williams-Grut, *Someone Transferred $99 Million in Litecoin—and it Only Cost Them $0.40 in Fees*, BUS. INSIDER (Apr. 23, 2018), http://www.businessinsider.com/a-99-million-litecoin-trade-took-just-25-minutes-and-cost-040-2018-4.

24. Elizabeth Townsend-Gard, Creating a Last Twenty (L20) Collection: Implementing Section 108(h) in Libraries, Archives and Museums (Oct. 2, 2017) (unpublished manuscript), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=3049158.

Rachel: I have had two different experiences with art licensing in my career—one, working in traditional image and rights licensing for Corbis Images for more than a decade, and the other, helping colleagues and businesses use open access imagery from museums in their commercial products. Admittedly, even though I was a regular user of open source software, when I started working with art released under a Creative Commons Zero (CC0) license, I had an initial reaction of open access as being too good to be true and wary of a "catch."

In 2016, I made my way to blockchain via a series of projects I was working on simultaneously as an entrepreneur: becoming a landlord in Seattle, experimenting with hosting on Airbnb, helping a friend implement an online booking system for cabin rentals in Alaska, discussing art licensing at a startup in New York, and indulging my general curiosity about our trust and sharing economy. The connections between real estate, art licensing, and blockchain may not be obvious at first glance but gaining a first-hand understanding of the power of trust, transparency, and connecting underutilized assets allowed me to see blockchain as a serious technology that could be used to empower artists and rights holders.

In the summer of 2016 I met Richard O'Leary, who was putting together a small team for a startup in New York called CultureTech, with the goal of opening up art and museum collections for reuse in creative projects. Richard was interested in learning about the mechanics of art licensing and asked me to join the distributed team to help with product strategy and development. Coming from a world of advertising, Richard aimed to bridge the gap currently facing the art world: creative individuals eager to incorporate a variety of art in their projects, but who struggle to access and reuse works from museum collections and contemporary artists. On one hand, there is the perception that art is very restricted and expensive to license, and on the other, millions of images are being released by museums under open access initiatives free of charge. *Will open access win out with free, unrestricted content, or can traditional licensing remain?*

The year before I joined CultureTech, my husband and I moved into a new house outside of Seattle, and we still owned a small condo in the city of Seattle. We became first-time landlords, renting the condo under a traditional long-term lease. In our house, we decided to experiment with short-term rentals of an extra bedroom on Airbnb.

After spending time talking about the challenges of art licensing with CultureTech, I started realizing that licensing is a lot like renting real estate, and perhaps we could learn from the disruption of the sharing

economy in the hotel industry. As a real estate owner, I set terms for the renter to access and to use the property over a specific duration of time. Just as a museum must first check their terms of object acquisition for any restrictions before extending a license, the type of agreement and the terms I set for a rental is heavily dependent on the property itself. A renter may not know about specific restrictions or constraints on my side, like certain rules that I have to operate within to extend a rental agreement in a community association with restrictive covenants or a larger building. For example, we are unable to rent out our condo in Seattle on Airbnb because the association bylaws do not allow short-term rentals; however, even if the building allowed short-term rentals, we do not think Airbnb is a good fit for that unit. Like a museum considering a license request for commercial reuse, the decision to rent out our condo under a long-term lease is a mix of terms we agreed to on purchase of the unit, and our feeling about best uses of the space. It is the opposite in our current house. The guest room isn't a good fit for a long-term rental but works well for a short stay.

In my experiences of traditional art and image licensing, I saw a consistent trend in user behavior: if a museum or an artist included a preapproval requirement prior to issuing a license, customers or product managers interested in a license would often decide to pursue alternative images without restrictions. The process was opaque, which meant risk for the person making the request and time would be wasted, compounded by uncertainty that a license could actually be secured. In our research at CultureTech we had a good understanding of the challenge for the museum. Just like I had to work within the condo bylaws, museums have to check the terms of an object's acquisition, whether by purchase or donation. However, through hosting on Airbnb, I realized that permissions and preapproval flows do not necessarily hinder transactions—that is, if well designed technology can provide flexibility and transparency for those seeking the transaction. As an example, despite only listing our guest bedroom for a few days a week, with a requirement to message us prior to renting, the first day it went "live" we got four or five requests, communication with guests was easy, and we quickly became "super hosts" based on the volume of guests and ratings. Airbnb is masterful at incorporating tools to build trust, verification, and transparent payments—and successful connections and transactions are made as a result. I would soon learn, although Airbnb is not based on blockchain, trust, verification, and transparency are also the hallmark benefits of blockchain.

As we started to see more parallels between art licensing and rentals, I started doing more serious research on the trust economy. I found people like Rachel Botswan and Bettina Warburg writing and talking about how trust is created in platforms like Airbnb and began looking toward the evolution of trust in blockchain technology. Rachel Botswan is an author, lecturer, and professor at Oxford University's Saïd Business School, where she teaches courses on the "Collaborative Economy" and "Trust in the Digital Age."[25] Bettina Warburg is a political scientist by training and is a blockchain researcher, entrepreneur, and educator known for her 2016 Ted Talk, "How the Blockchain Will Radically Transform the Economy."[26] Both are compelling speakers and make a powerful case for understanding the impacts of distributed ledger technology on society and the economy.

I was hooked. I picked up a copy of *Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World* by Alex Tapscott and Don Tapscott, and I couldn't put it down. When I got to the section on "Creative Culture: Emergence of a New Music Business Model," I was elated. If what they were describing around ownership ledgers and smart contracts was possible, it got to the heart of most of the problems that I had encountered in traditional art licensing. *How do you manage preapprovals quickly? How do you deal with split royalties or micropayments? How do you get multiple rights holders confirmed? How do you do this across thousands of rights holders and customers?* I realized that regardless of what CultureTech would develop, discussions around how blockchain could be used for intellectual property licensing needed to be part of the plan.

From this vantage point, asking the question of open access or traditional license didn't make sense. The real issue with accessing art is not the specific license that is applied. The problem is in the current methods for acquiring and verifying the license. This is where blockchain and smart contracts come in: distributed ledger technology means transparent records of ownership, easily accessible to the licensor and licensee. With smart contracts, rights holders can clearly and directly communicate their terms, and both parties receive the security, trust, and verification through the record chain. Anyone working on licensing initiatives should see this on the horizon.

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25. *Rachel Botsman*, FAST COMPANY, http://www.fastcompany.com/user/rachel-botsman (last visited Feb. 19, 2019).

26. *Bettina Warburg: Blockchain Entrepreneur and Researcher*, TED, http://www.ted.com/speakers/bettina_warburg (last visited Feb. 19, 2019).

A. Part One: Identifying Opportunities in Record-Keeping Ecosystems

There are many startups that see the art market as an opportunity to employ blockchain technology. Its appeal is understandable: tracking the authenticity and provenance of an artwork is central to the value of the art, sales channels are changing, and the market is estimated to be worth $56 billion globally per year.[27] Companies like Verisart, Ascribe, and Codex appeal to artists and collectors, looking to certify their ownership in a digital record of provenance. Rather than study these startups, our preference for this research is to analyze existing business ecosystems in which individuals and institutions are involved in consistent, structured business processes. We looked for situation-specific examples of adding blockchain technology to an existing ecosystem in order to understand what makes a business process more efficient.

In 2016, Walmart started research on the use of blockchain as a means of recording their supply chain with IBM and Tsinghua University, focusing on two products: pork in China and mangoes in Mexico.[28] The end result: identifying problems in their supply chain took seconds rather than weeks.[29] This breakthrough granted food producers, distributors, and consumers new benefits: increased control (safety, efficiency, and savings) and access (shared information with producers and customers).[30] By August 2017, nine other companies, including Nestle, Unilever, Kroger, and Tyson Foods, joined a new blockchain coalition.[31] Not even a year later, all ten companies released the "IBM Food Trust" blockchain technology with over 1 million items in fifty categories, "connect[ing] growers, processors, distributors, and retailers through a permissioned, permanent and shared record of food system data."[32]

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27. CLARE MCANDREW, ART BASEL & UBS, THE ART MARKET 2017, at 14 (2017), http://d33ipftjqrd91.cloudfront.net/asset/cms/Art_Basel_and_UBS_The_Art_Market_2017.pdf.

28. Isabelle Roberts, *Walmart and Block Chain: It Takes Two to Mango*, DIGITAL INITIATIVE (Nov. 14, 2017), http://rctom.hbs.org/submission/walmart-and-block-chain-it-takes-two-to-mango/.

29. *Id.*

30. *Id.*

31. Robert Hackett, *Walmart and 9 Food Giants Team Up on IBM Blockchain Plans*, FORTUNE (Aug. 22, 2017), http://fortune.com/2017/08/22/walmart-blockchain-ibm-food-nestle-unilever-tyson-dole/.

32. Kim S. Nash, *Walmart-Led Blockchain Effort Seeks Farm-to-Grocery-Aisle View of Food Supply Chain*, WALL ST. J. (June 25, 2018, 1:05 PM), http://blogs.wsj.com/cio/2018/06/25/walmart-led-blockchain-effort-seeks-farm-to-grocery-aisle-view-of-food-supply-chain/; *see also IBM Food Trust*, IBM, http://www.ibm.com/blockchain/solutions/food-trust (last visited Feb. 2, 2019).

Stan: There is a divide between public, permissionless blockchain network communities, like Bitcoin, and enterprise, permissioned blockchains. As previously discussed, blockchain technology is essentially a data structure. The real innovation is the consensus mechanism. Blockchain networks are expensive, but the monetary costs of running them are outweighed by the benefits gained through independent parties working together to achieve a common goal. As well as costs of trust, transactions incur a number of other costs including obtaining information, bargaining and reaching an agreement, and policing and enforcing the agreement.[33] Thus, if these transaction costs are significant, blockchain is most likely a good technological solution.[34] For smart businesses, this cost equation is not a "back of the napkin" calculation. To convince businesses to switch to a private or public blockchain approach will require demonstrable proof of cost savings or improved efficiencies compared to other database solutions.

To date, most prototype, enterprise blockchains do not go beyond the proof of concept phase. One of the first live enterprise blockchains, we.trade, outsources most of its development to IBM.[35] IBM is not only responsible for the development of several enterprise blockchains but is also the owner of growing blockchain patent portfolios.[36] IBM's patent acquisitions are troubling for the future of the open source software components of the technology because as an owner of a patent, IBM has the power to exclude others from using particular methods contained in the patent.[37] So, enterprise blockchains can use combinations of IBM tools on top of Hyperledger, an open source blockchain framework maintained by the open source-based Linux Foundation. Nevertheless, one of IBM's patents includes a method for storing data on a blockchain so that only those with the decryption key may see the data.[38] With public blockchains like Bitcoin and Ethereum, anyone can see the data stored on the blockchain. It is transparent. Thus, IBM's patent offers businesses an

33. Davidson et al., *supra* note 9, at 2.

34. *Id.*

35. Ian Allison, *The First Live Enterprise Blockchain Sets Sights on Every Area of Global Trade*, COINDESK (Jan. 10, 2019), http://www.coindesk.com/the-first-live-enterprise-blockchain-sets-sights-on-every-area-of-global-trade.

36. *IBM Earns Record 9,100 Patents in 2018, Tops U.S. Patent List*, MKT. WATCH (Jan. 8, 2019), http://www.marketwatch.com/press-release/ibm-earns-record-9100-patents-in-2018-tops-us-patent-list-2019-01-08 [hereinafter *IBM 2018 Patents*].

37. *See* Jeff John Roberts, *As Blockchain Grows, Companies Look to Avert a Patent War*, FORTUNE (June 19, 2018), http://fortune.com/2018/06/19/blockchain-patent/

38. *IBM 2018 Patents*, *supra* note 36.

ability to use the blockchain as a verification and settlement layer without outside parties to the transaction seeing the information. This data viewing process has been incorporated into the Hyperledger Fabric framework.[39]

In 2015, Hyperledger was created as an umbrella project to facilitate the development of enterprise-grade, blockchain-based distributed ledgers.[40] The Hyperledger project creates open source frameworks and tools to promote business-focused blockchain technology. The frameworks include Hyperledger Fabric, Hyperledger Sawtooth, Hyperledger Iroha, Hyperledger Burrow, and Hyperledger Indy.[41] Burrow is Hyperledger's general smart contract machine developed to comply with the Ethereum Virtual Machine.[42] Those familiar with writing Ethereum smart contracts are able to run smart contracts in a Hyperledger environment that is marketed as a secure, legally compliant, cross-industry, and cryptocurrency free environment.[43]

With the development of Hyperledger incorporating Ethereum capabilities, the question becomes the level of participation a company wants in its ecosystem. Right now, there are three options to choose from when building an enterprise blockchain application: Hyperledger, public Ethereum, or private Ethereum. Enterprises looking to use private Ethereum to maintain a level of privacy of their data can incorporate Ethereum clients like Quorum or Pantheon, thus having the option of connecting to data on the public Ethereum blockchain (the "mainnet").[44] The bridge to the mainnet gives an enterprise network access to the vast Ethereum ecosystem that includes thousands of Dapps, developers, users, and data points.[45]

Rachel: I was very excited to learn about Walmart's research initiative with IBM and Tsinghua University. Growing up in eastern Washington

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39. *Id.*

40. Diana Ngo, *Hyperledger Project Hits 100 Members with Addition of China's SinoLending, Gingkoo, ZhongChao*, BITCOIN MAG. (Nov. 30, 2016), http://bitcoinmagazine.com/articles/hyperledger-project-hits-members-with-addtion-of-china-s-sinolending-gingkoo-zhongchao-1480530607/.

41. *Hyperledger Business Blockchain Technologies*, HYPERLEDGER, http://www.hyperledger.org/projects (last visited Feb. 19, 2019).

42. *Hyperledger Improvement Proposal (HIP)*, HYPERLEDGER BURROW (Mar. 28, 2017), http://www.hyperledger.org/wp-content/uploads/2017/06/HIP_Burrowv2.pdf.

43. *Id.*

44. *5 Reasons Why Enterprise Ethereum Is so Much More than a Distributed Ledger Technology*, MEDIUM: CONSENSYS (Dec. 12, 2018), http://media.consensys.net/5-reasons-why-enterprise-ethereum-is-so-much-more-than-a-distributed-ledger-technology-c9a89db82cb5.

45. *Id.*

State, where agriculture is the dominant industry, I can relate on a personal level to the importance of tracing your food from where it is grown to the store shelf. It is becoming increasingly common for people to become victims of food-related outbreaks like ecoli, and it remains difficult for companies and the FDA to locate the source of the problem in the supply chain. The result is a negative spiral, with the public becoming apprehensive and distrustful of companies and a specific type of item, while producers in the supply chain without tainted items are hurt economically by association. Being able to trust and verify in seconds that your food is safe is an incredible new development in technology that can protect the producer and consumer.

What intrigued me even more was their use of Hyperledger Fabric to create a private blockchain, and their invitation to other major players and competitors to join in the creation of a consortium. Essentially, they could work together to figure out how it could work, setting the rules, getting the data structure set in a way that could work across multiple organizations.

An initiative like IBM Food Trust requires the right mix of players with shared interest in transparency. In the art world, it will take museums, art historians, library scientists, technologists, intellectual property attorneys, and entrepreneurs working together to make an art and intellectual property "supply chain" come to life. It will also mean working with a lot of paper, old workflows, and messy information—just like what IBM Food Trust is doing. The history on those contracts and forms must be translated into digital—along with people willing to embrace a new workflow over the analog experience they know today.

We are seeing museums collaborating on initiatives to combine their records. This is essentially the same as the start of the IBM Food Trust blockchain: a common goal and agreement on standard terminology in order to efficiently map out and share data. In 2014, the American Art Collaborative established a consortium of fourteen museums in the United States working to combine Linked Open Data (LOD) with the goal of getting a critical mass of data about art on the semantic web by establishing standards for best practices and shared terminology.[46] In 2017, arts patron and Walmart heir Alice Walton founded Art Bridges, a nonprofit foundation to bring together museums for shared exhibition programming and loans to make exhibitions accessible in rural areas and at venues with

46. *The American Art Collaborative Linked Open Data Consortium*, SMITHSONIAN AM. ART MUSEUM, http://americanart.si.edu/about/lod/aac (last visited Feb. 19, 2019).

small operating budgets.[47] To date, there are more than seventy participating institutions.[48] Of those participating, some have also released open data on their collections, including The Met, MoMA, and the Smithsonian American Art Museum. Neither of these are blockchain initiatives, but I admire that there is leadership and desire to bring museum collections together in bigger ways to expand reach and impact across the United States.

B. Part Two: Open Data Challenges / Ownership and Copyright

The release of data sets and digital images under CC0 or Creative Commons attribution licenses (CC-BY) is, in part, due to changing requirements for foundations and organizations to develop research grants. In 2013, federal agencies awarding grants were directed to make results publicly available.[49] Leading foundations, including the Bill & Melinda Gates Foundation, Andrew W. Mellon Foundation, Ford Foundation, and William and Flora Hewlett Foundation, use certain terms to make research immediately accessible to the public.[50]

The approach of releasing open collection data is admirable, and in doing so, these museums create transparency around the vast number of objects that they own and preserve. However, the challenge is in allowing visibility of the other layers of intellectual property linked to those objects.

Museums attempt to make copyright information about a work more transparent by displaying information on their websites including naming the artist, the estate of the artist, or the agency that manages the copyright licenses on their behalf. As a consequence, it gives the appearance that the primary means of determining the ownership of a work is based on the artist, rather than the work's history and provenance. It is our argument that along with transparency of physical ownership of works of art, the ledger of ownership should also include the history of the object's copyright—including transfers and expirations.

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47. Press Release, Alice Walton, Alice Walton Announces Formation of Art Bridges (Sept. 13, 2017), http://www.alicewalton.org/artbridges.html.

48. ART BRIDGES FOUNDATION, http://artbridgesfoundation.org/partners/ (last visited Feb. 19, 2019).

49. Press Release, The White House, Office of the Press Sec'y, Obama Administration Releases Historic Open Data Rules to Enhance Government Efficiency and Fuel Economic Growth (May 9, 2013), http://obamawhitehouse.archives.gov/the-press-office/2013/05/09/obama-administration-releases-historic-open-data-rules-enhance-governmen.

50. Carl Straumsheim, *Openness by Default*, INSIDE HIGHER ED (Jan. 16, 2017), http://www.insidehighered.com/news/2017/01/16/gates-foundation-open-access-policy-goes-effect-joining-others.

If collection data sets and copyright determination tools are combined, then getting a real answer on copyright status by examining the work's history can be quick and efficient. Without that kind of technology, when faced with millions of records, it is understandable why a museum would use a rule of thumb of identifying the artist then applying the formula of "death plus seventy years" to filter out works under copyright. This approach is a means of speeding up the process of determining public domain works and reducing risk for the institution. However, it also means that works in the public domain may be unnecessarily restricted, while reinforcing legal misperceptions that the copyright status of a work always hinges on an author's lifespan.

Distributed ledger technology may prove to be a powerful mechanism for removing silos between institutions and allowing more control over the distribution of data by the owners. With clear data, there can also be streamlined approaches to creating smart licensing agreements. The owner of the artwork controls their information, and the copyright owner manages theirs. Permission is not arbitrarily withheld because there is a lack of information. Rather, imagine a world where more rights owners can be invited to participate on their terms. In that framework, people can clearly identify and reach out to verified owners and rights holders and seek the permission simultaneously—with permission granted and recorded when all rights holders confirm. That is the next generation of access.