Convening Technologies: Blockchain and the Music Industry

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This article traces the debates occurring in the music industry where blockchain technology surged as an ideal solution for long-standing disagreements over distribution, publishing, licensing, sales, streaming, and listening. The projections (in conferences, media, opinion pieces, and academic reports) started as techno-utopian, but over time the discourse shifted from "radical" to "incorporative" goals. The technological dreams were scaled back as the scope of social challenges to technological solutions became clearer. Borrowing from Clive Barnett's theory of convening publics, we argue that the role of the blockchain in this environment was not necessarily as a technological solution, but rather as a "convening" force that brought disparate actors together. Nonetheless, we still have to ask, who is invited to convene, and who is left out?

Keywords: music, technology, techno-utopianism, publics, blockchain

In 2016, music business analyst Stuart Dredge declared that the year's "buzz-panel of choice for any music conference is blockchain technology" (para. 8). How did blockchain, best known as the technology behind Bitcoin, become such a hot topic in music? If any industry has been radically disrupted by the rise of digital technologies, it is music (e.g., Wikström, 2013). For some—notably those excluded from the historically centralized, opaque recording industry—this disruption has offered hope for freedom from long-standing problems, especially problems of wide distribution and fair compensation. For others, it destroyed taken-for-granted business models. For both sets of actors, as this article will show, the digital promises of blockchain resonate well with the problems they face. If blockchain enthusiasts could at times be accused of being people holding hammers seeing all problems as nails, people in music might be seen as people holding varied nails and hoping that the blockchain hammer offers a unified solution to long-standing problems in music production, distribution, publishing, licensing, sales, streaming, and listening.

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In her work on blockchain dreams, Lana Swartz (2017) characterizes blockchain projects as either "radical" or "incorporative." "Radical" projects intend to use the blockchain to create a totally new techno-economic order. Most of these initiatives are aligned with Bitcoin's political themes: decentralization, autonomy, and privacy. Some are even more ambitious in their scope and scale, aiming to bring about not just targeted solutions, but "holistic systems of decentralized, nonhierarchical, autonomous self-governance" (Swartz, 2017, p. 86). Incorporative blockchain projects do not necessarily seek to change the underlying order from a political or social perspective; instead, they seek to incorporate the blockchain into the existing system to make that system more efficient.

The music industry's vision of blockchain troubles Swartz's dichotomy between radical and incorporative. On the one hand, many blockchain enthusiasts in music do have utopian dreams for blockchain applications. These dreams are certainly radical, conjuring visions of a completely decentralized, distributed, automatic means of disseminating and paying for music. But music-focused blockchain dreams are simultaneously (and increasingly) incorporative, imagining an industry overhauled rather than erased.

Though we look at the case of music, blockchain enthusiasm is increasingly common among those seeking to "fix" finance, law (De Filippi & Wright, 2018; Fairfield 2014), health care, diamond sales, government, development and poverty alleviation, digital art (Zeilinger, 2018), and nearly all other industries. Entrepreneurs, activists, and others have created start-ups, working groups, workshops, hackathons, and conferences to understand what blockchain is and how it might solve problems in an enormous and expanding range of domains. Our focus is not on the technical implementation of blockchain in the music context. Instead, we analyze the discourse within and around four prominent events in the blockchain music hype cycle to show how blockchain, as an only almost-ready technology, served as a focus to bring diverse actors together as a sonic public striving to collaboratively reshape infrastructures.

We argue that the technological utopianism of the blockchain dream has motivated diverse stakeholders to come together to identify and name problems and to think in new ways about how to solve them. We posit that the blockchain, as it is used in the music industry, should be seen as a "convening technology" that helps to build (in this case, sonic) publics or to reorder old ones. Our point is not whether blockchain can or can't fix the problems the music industries face, but that the resonant match between the qualities of those problems and the promises of the blockchain have inspired a new conversation with outcomes yet to be determined.

Borrowing from Clive Barnett's (2008) theory of convening publics, we view blockchain as a convening technology in that it initiates and serves as the focus of a conversation that can address issues far beyond what it may ultimately be able to address itself. A convening technology marshals resources and institutions and other forms of power. It is a pretext for collective decision making and compels common purpose. It implies eventual shared standards—that is, conventions of practice. "Convening" also signals an ongoing process. Barnett (2008) emphasizes the "active sense of convening, rather than a sense of a convention already successfully gathered together, or conforming to a rule already agreed upon" (p. 9). In this article, we trace this active, processual convening around blockchain in the music industry.

Most of the time, the story of new technologies goes like this: In the early phases, a technology is met with utopian and dystopian tales of wonderment and horror. As it becomes part of everyday life, its assumed effect is also domesticated, and we begin to tell syntopian stories that bring nuances of good and bad to our understandings of the technology (Katz & Rice, 2002; Nye, 2004). Though scholars may dismiss utopianism as naive, the case of blockchain in music allows us to see its practical benefits. Utopian hope can allow diverse stakeholders to convene in new ways, bridging difficult divides and opening alternative approaches to endemic issues. Convening technologies thus become a way to galvanize goodwill and to imagine a specific shared potential future, together with implications that have value beyond any ultimate success of the technology around which they convene.

To examine the discourse around blockchain in music, we focus on four key events and the press and publications surrounding them. We collected news articles, reports, white papers, manifestos, and blog posts about the role of blockchain in the music industry, beginning with these events and spiraling outward, ultimately putting together a collection of 96 such artifacts. In addition, we attended industry events and panels that focused on blockchain in music, including those described next and others, such as Norway's by:Larm. We analyzed the artifacts and field notes to identify the problems the blockchain was posited to solve and to track changes in the discourse over time.

We begin with a brief introduction to blockchain before drawing on our materials to paint a picture of the conversation blockchain convened between 2014 and 2017. We describe the dream as envisioned by its advocates, before examining the technological and social challenges facing the successful implementation of this hype that were raised in the discussion as both advocates and critics iterated toward shared understandings. Finally, we show how blockchain, as a convening technology, may prove to be an example of socially useful techno-utopianism, but likely with more modest outcomes than some stakeholders may have initially imagined.

Blockchain for Music

What Is the Blockchain?

Blockchain is suddenly everywhere, yet few know what it means. First proposed by mystery man/woman/group Satoshi Nakamoto around 2007, developed through 2008, and launched in early 2009, the first and best-known use of a blockchain has been as the technology that powers Bitcoin. Put simply, a blockchain offers a multipurpose, decentralized, permanent, transparent ledger. The blockchain enacts and records all transactions that take place across a peer-to-peer network. Think of a spreadsheet that is duplicated thousands of times across a network of computers. That network is designed to regularly update and reconcile this spreadsheet so that there is one agreed-upon authoritative version that the node computers jointly host. It is write-only, so although lines in the ledger can be added, they can't be deleted. Because it is decentralized, the ledger is publicly viewable, and, at least in the ideal, anyone can host it on their own machines.

No one actually "owns" Bitcoins, for example. Rather, they unlock a claim to entries in the distributed ledger called the blockchain. When someone wants to transfer ownership of a Bitcoin, they

instruct a node computer to broadcast the transfer to all the other node computers. The message is then verified across the network, the transfer is added to the ledger, and the blockchain is updated. The database isn't stored on any one single computer or location, so, in theory, the records it keeps are visible and verifiable. This offers the promise of permanent, transparent record keeping.

Sometimes people append text and other messages to Bitcoin transactions, and those messages are permanently recorded in the blockchain. In the first Bitcoin transmission, Satoshi Nakamoto stored a message referencing the UK bank bailout. People have recorded their marriage contracts in the Bitcoin blockchain. Thus, it is not surprising that Bitcoin enthusiasts have thought up other uses for the idea of a permanent, distributed database, such as automated contracts. The technology embodies what Lawrence Lessig called "Code is law," meaning the automated regulation of processes by the technology itself.

Perhaps the most established, best-known effort to make blockchain into a multipurpose platform is Ethereum, which was proposed in 2013, funded by crowdsale of its own cryptocurrency, Ether, in 2014 and launched in 2015. While the Bitcoin blockchain is used to track ownership of Bitcoins, the Ethereum blockchain was designed to build and run decentralized applications of any kind. Ethereum was also meant to support "smart contracts," protocols intended to facilitate, verify, and enforce terms set between parties. (DuPont and Maurer [2015] better explicate the current pitfalls and dreams of Ethereum and smart contracts.) This has been extrapolated to imagine full businesses run on blockchain smart contracts, or decentralized autonomous organizations.

Blockchain Dreams

This section traces the rise of the radical utopian blockchain dream in music through four sets of events. The first began in late 2014 when D. A. Wallach, a musician, investor, and, for several years artist-in-residence at Spotify, penned a column in *Wired* called "Bitcoin for Rock Stars." His article did not name blockchain explicitly, but argued that "by applying the technical breakthroughs of these networks, we can sensibly organize data about music for the first time in human history and, more importantly, reinvent the way artists and rights-holders get paid" (Wallach, 2014, para. 3).

Wallach (2014) envisioned a new platform with two functions. One would be to "contain accurate, real-time, global data encompassing credits and rights ownership," which would be "the universal, authoritative reservoir for these types of information" and "would be open to and accessible by anyone" (para. 26). Second, the platform "would serve as an instantaneous, frictionless payments routing infrastructure for all music usage fees and royalties" (para. 27). He drew on Bitcoin to imagine how the platform might work, but ceded that "the huge number of practical details involved in this plan are beyond the scope of this essay" (para. 55).

Wallach was hardly the first to call for a universal, authoritative global music database. While the book publishing industry has long had International Standard Book Numbers (ISBNs) to identify and trace the work it creates, music has never had a standardized shared system. As music publics have become increasingly atomized and fractured across digital apps, sites, stores, and media, the problem has only gotten worse. Audio files are surrounded by messy, inaccurate, and limited information. Robert

Ashcroft, CEO of the United Kingdom's largest music collective management organization, PRS for Music, has declared that "the biggest issue facing the industry in the internet era is metadata" (Howard, 2016, para. 25). Song files rarely carry metadata about who wrote the music, who performed it, who produced it, who else was involved with its production, or who holds the rights to its use. Some of the loss is symbolic; without liner notes that name them, people's "moral right" of recognition is diminished (O'Dair & Beaven, 2017). But the loss is also financial. Without knowing who gets credit, people can't be paid for their work. Without knowing who owns music, it can't be licensed.

Prior, centralized attempts to create a universal database for music have failed magnificently. The Global Rights Database project was started in 2008 by an EU commissioner. In 2010, the project solicited engagement from more than 80 organizations, issuing recommendations later that year. They gave up in 2014, "leaving behind a debt of more than $13.7 million," reportedly because the collection societies pulled out (Milosic, 2015). Similar efforts, like the International Music Joint Venture, formed by the collection societies to build a common digital copyright administration organization, or the World Intellectual Property Organization's International Music Registry, also failed (Milosic, 2015). Wallach drew on Bitcoin's promises of accuracy, immediacy, globality, openness, accessibility, and frictionless payment to imagine blockchain as a radical new model that might be able to succeed where these efforts failed.

Several events in 2015 made Wallach's vision seem both necessary and achievable. For one, people began trying to build it. That year, the exemplary "entrepreneurial musician" (Morris, 2014) Imogen Heap became interested in blockchain. Heap had come to see the music industry as a "complete mess, a rusty, overstretched, tired machine" with "deep opacity" that could barely be navigated "if you're human" (Howard, 2015d, para. 12). She decided to develop an alternative. Inspired in part by conversations with fellow independent musician Zoë Keating, who had recently attended the Blockchain Summit Richard Branson held on his private Caribbean island, Heap decided to try using blockchain to build what she called a "fair, true, bright and shining home for music" (quoted in Howard, 2015c, para. 24).

Heap envisioned an ecosystem she called Mycelia, after an underground fungus that grows for miles. In her extended metaphor, creative content would be "spores," services "mushrooms," and all would be connected through the rhizomatic "Mycelial network" of the blockchain. "I just thought, one space where the DNA of my music and all my tastes and all the things that went into this song, go into this place, and it is the official verified thing," she wrote (Heap, 2015, para. 12), "and then from there, everything stems, all the services stem from this bed of music, of all the music that ever lived. Ya know, one day" (para. 12). Heap joined with the blockchain music start-up Ujo Music, which relied on Ethereum, to release Heap's song "Tiny Human" using blockchain on October 2, 2015. By the time the song was taken down, Heap had sold just 222 copies at $0.60 apiece, earning a total revenue of $133.20. Sales were held up in part by the fact that the song could be purchased only with Ether, meaning that listeners had to buy into the blockchain system Ethereum and purchase its cryptocurrency. Even for those tech savvy enough to try, the process did not always work. As proof of concept, the results were mixed.

As Heap was working on Mycelia, Rethink Music, a project of the Berklee College of Music's Institute for Creative Entrepreneurship, issued a widely read report titled "Fair Music: Transparency and

Payment Flows in the Music Industry" that identified barriers to fairness. It traced the many byzantine pathways of payment distribution, calling them out as unfair to artists and rights holders and showing that 20%–50% of music payments never reach the rights holders, and when they do, it can take years. The Fair Music report located the problem in the lack of a common database for copyright management and opaque payment flows. It concluded with a call to investigate the blockchain as the potential solution.

On the heels of the Fair Music report, its authors, including Panos Panay and Allen Bargfrede, ran a series of events on fair music, first under the banner of Rethink Music, and then as the Open Music Initiative (more on this transformation later). Exemplifying the convening function of blockchain, panels were comprised of people who rarely sat together, let alone spoke together, and the settings were designed to encourage both discussion and action. Speakers and attendees included people from across the music industries: artists, label representatives, publishing rights organization representatives, music managers, and technologists.

For instance, in October 2015, Rethink Music hosted a workshop on fairness and transparency to create

> public discussion on the issues and recommendations we've raised in our report as well as an afternoon of facilitated discussions designed in conjunction with our partner IDEO, specifically to solicit feedback and input on how we can move forward to resolve issues related to transparency and fairness for creators. (Rethink Music, 2015, para. 1)

In addition to a panel moderated by one of this article's authors, the workshop featured a mix of participants, including the CEO of digital music services company Kobalt; representatives from Spotify, YouTube, the (nonprofit) Future of Music Coalition, the Songwriters Association of Canada, fan-funding platform PledgeMusic, PRS for Music, and PeerTracks; and artists, managers, consultants, and start-ups. Imogen Heap made an appearance via Skype. Some months later, in July 2016, the Open Music Initiative hosted a similar workshop at the MIT Media Lab, as it launched a sprint for students to build systems to facilitate more fairness and transparency in music. The event included people from the Recording Industry Association of America, SoundExchange, Universal Music, Warner Music, and Sonos as well as several blockchain startups, among others. Similar workshops were held in New York City and other locations. As of this writing, Open Music Initiative events are ongoing. Throughout these events, blockchain ran through the discussions as solution, delusion, and new reason to talk.

Toward the end of 2015, Benji Rogers, who had started PledgeMusic and had spoken at some of the events mentioned earlier, wrote a blog post called "How the Blockchain and VR Can Change the Music Industry." Ever the optimist, Rogers (2015) argued that "no new technology encapsulates . . . the potential for positive change for this suffering music industry more than the Blockchain" (para. 4). In his post, Rogers imagined a "Fair Trade Music Database" in which every song would have "Minimum Viable Data" (MVD) attached to it. The database, like that envisioned by Wallach, Heap, and others, would be decentralized and unowned. Those uploading music could add "basic Smart Contract-readable information to the MVD dataset." Rogers pitched Virtual Reality, a new format that did not yet have a file standard,

as "the Trojan Horse to seed this new format" (para. 20). Within a year, Rogers had venture capital funding to start Dot Blockchain Media, and Bargfrede had left Berklee to join him in the venture.

The utopian music blockchain vision articulated through these four events has motivational power, even when it veers from the feasible to the fantastic: Rather than an opaque mess controlled by centralized industrial figures, there will be a transparent, decentralized shared registry in which each song bears not only a unique fingerprint but also a unique, correct, and definitive set of metadata, indicating who gets credit for everything. Instead of independent musicians or labels having to get music distributed everywhere, they could enter it into the blockchain where it would be available to all. The blockchain network that promulgated this music would be unowned, shared by anyone who wanted to be part of its public, and distributed, so that anyone could host and update it, receiving some sort of compensation, symbolic or otherwise, for their effort.

This music blockchain registry would function as a combined repository and card catalogue, yet going beyond that with immutable smart contracts to encode the terms of the music's use. Copyright and distribution would be "automatically enforced and documented by the protocol of the network" (Dovey, 2015, para. 2). Licensing for reuse would be possible with a single click. Such single clicks could also manage the instant separation and distribution of payment. "With blockchain it can be done through smart contracts and machines" (Howard, 2015f, para. 73), waxed Berklee professor and blockchain enthusiast George Howard in one of a series of interviews he ran on the topic for Forbes. "It could automate the irritating bookkeeping for creative types," suggested a writer in the *Observer* (Dale, 2015, para. 13). "I can imagine instant frictionless micropayments and the ability to pay collaborators and investors in future earnings without it being an accounting nightmare," extolled Zoë Keating (quoted in Ingram, 2015, para. 9).

With "a consensus mechanism built into the network architecture" (Sweeting, 2016, para. 6) managing all the transactions, "blockchain technology removes the need for trust" (O'Dair & Beaven, 2017, p. 472). In a transparent, automatic, smart system, no one could hide money that another was due. It would also obviate the need for many third parties. Artists wouldn't have to affiliate with a publishing rights organization, "there would be no need for intermediaries such as ASCAP, BMI, Harry Fox, SoundExchange, et al." (Howard, 2015g, para. 26). Musicians like Heap and Keating—and anyone else—could put their own music in the blockchain, wrap it in their own smart contracts, perhaps giving shares to fans and others they'd prefer to see funded rather than the usual players (Dovey, 2015), and do away with rent-seeking middle people altogether. The blockchain's public and transparent nature would make music transactions visible, meaning that even those who did not take charge of their own careers to such an extent could still independently accurately see how and how much their music is used and whether they had been justly compensated.

The Dream Faces Challenges

Graham (2015), writing for musicians' activism blog *Trichordist*, describes the actors promoting this dream as believing that "by writing practically everything into a blockchain they will solve all the issues and we'll suddenly be returned to a time of unicorns and rainbows, with more money than ever before falling from

the sky" (para. 5). Perhaps, as Arcand (2017) suggested, writing for *Watt*, it may all be "just more smoke-and-mirrors publicity jargon from a handful of new companies all racing to become the next Spotify in a market still limited to eccentrics" (para. 5). However, as we will show in this section, far from falling into easy utopian and dystopian discourses, the discussions to which these dreams gave rise in workshops and published articles, blog posts, and interviews quickly turned nuanced, as participants raised both technological and social challenges. In this section, we recount the challenges raised in the conversation.

There are numerous technological challenges for implementing blockchain in music as described in the full dream. First, enthusiasts often imagine (or assert) that the technology is much more mature than it is. Tellingly, buzz around the blockchain in the music industry began in 2014, before Ethereum, the most advanced general purpose blockchain system, was even produced. Several years since Ethereum went into beta, the technology is still in its infancy. Again and again, we have heard from those involved in blockchain initiatives across industries that the technology is "not yet ready for primetime."

In the *Trichodist* piece, Graham (2015) cautioned that

we could be looking at many terabytes a day and a few petabytes a year in data, likely more.
All of this data has to move and be stored somewhere, and there is a cost to that in financial
and time factors as well. (para. 23)

In his book, *Attack of the 50 Foot Blockchain* (2017), David Gerard argued that the blockchain cannot work for the music industry. First, he posits that there is no one single blockchain that can scale to the task. There is simply too much music. With an estimated 35 million songs in iTunes in 2013 and a billion daily Spotify streams (as of 2015), music would require multiple blockchains and they would need reconciliation. He identified other problems.

Apart from the metadata itself being huge, there's the encoded details of all the hundred-
page contracts. Who are the participants in the blockchain who will each be keeping their
own copy of all of this data? And who will pay for the computing resources to execute all the
smart contracts for each song played? (p. 131)

Indeed, according to a recent study by technical analyst Alex de Vries (2018), Bitcoin—currently the most fully realized blockchain—can be estimated to consume nearly as much energy as the country of Ireland. As historians of technology, such as Zac Zimmer (2017) and Nathan Ensmenger (2015), have pointed out, there are environmental "costs" of wrangling all those terabytes and petabytes. Other technological challenges include "threats of security, virtual money system collapse, impact of non-virtual currency systems, money laundering, tax evasion, [and] value fluctuation of virtual money" (Richter et al., 2015, p. 1).

There may be eventual technological solutions for technical problems, but technology can't solve the social ones standing between the music world that exists now and that idealized one. The social challenges to implementing blockchain as imagined are daunting. As music industry consultant Vicki Nauman, a core member of the Open Music Initiative, argued at music conference South by Southwest, "the biggest underlying business problem facing metadata is to get the incentive and everybody aligned to fix things" (Rys, 2016, para. 12).

Among those to align are artists, intermediaries, and audiences. What is good for one stakeholder may not be good for all. Not all are even convinced that the problems identified in this discourse are the most important ones, placing the blame instead on exploitative technology companies that could pay fairly within existing systems but do not. The International Federation of the Phonographic Industry (IFPI), and many vocal musicians, would argue, as the IFPI did in response to the Fair Music report, that "the real problem for artists and record companies is that some of the largest digital services in the world claim to be exempted from copyright and do not pay a fair market value for music to artists and labels" (2015, para. 4).

For the blockchain dream to succeed, there must be "the resilience and willingness of musicians and artists to begin distributing their work on these new platforms" (Dovey, 2015, para. 14). Artists have a strong incentive—cutting out middlemen could, at least in the ideal—give them more control and more revenue. But for intermediaries, most of whom would also have to get on board, the motives are more mixed. "The parties who benefit most from the lack of transparency are the ones who will resist anything that ends the lack of transparency," warned Howard (2015b, para. 5). While independent artists, such as Heap and Keating, may see some as rent-charging parasites, the publishing rights organizations these technologies promise to erase view themselves as valuable. Wallach warns that "no one in the media industries basically trust each other" (Howard, 2015f, para. 39), and with the failure of previous efforts to create a unified database, it is easy to imagine an even more diverse set of actors failing to agree on terms here. "The reader," writes Lahr (2015) in music industry blog *Hypebot*, "is left wondering how any trade, much less the music trade, could get there" (para. 15). Lahr identifies some of the reasons:

> for the labels, in particular, the relationship with the music creator is one of work for hire.
> For the technology companies, music has been a means to an end that is far removed from
> just music sales. [. . .] even Spotify's Daniel Ek must know that music is but one of the
> secret sauces to grow the company. (para. 15)

Even if the intermediaries and the artists were on board, as Stuart Dredge (2015) pointed out in the *Guardian*, "it's unclear who would take responsibility for setting up and overseeing a blockchain network for music payments, with cryptocurrency expertise rare within the existing industry bodies" (para. 16). There is no shortage of new intermediaries who would like a shot at providing both the expertise and the technology. Heap worked with Ujo Music, which uses Ethereum. Rogers's venture, Dot Blockchain Media, established its first blockchain node in November 2017. Discussions also mention PeerTracks, Resonate, Revelator, Aurovine, Bittunes, Tao, Blokur, Ascribe, Monegraph, and the One Click License platform. However, less discussed are questions of labor. Who is going to enter all the metadata? What about the back catalogues? Some imagine the musicians cheerfully entering all the accurate metadata, perhaps because they cannot upload the music otherwise, yet managers, familiar with musician wrangling, may laugh audibly at the idea that artists can be tasked to encode their song files with all the necessary metadata. Others imagine some sort of crowdsourcing of data, gesturing toward unspecified humans—perhaps fans—in the loop of "frictionless" automation.

The end users of music, the listeners, are also minimized in these visions. Sometimes they appear briefly as fans who will be delighted to pay knowing there is no intermediary. Other times they are shareholders and currency miners, getting a cut of the communal music property. In either scenario, and in any other, they,

too, would need to adapt the blockchain's medium for accessing music. "The blockchain is not magic," writes Bartlett (2015) in the *Guardian*, noting that

> what matters most is whether consumers use it, and how existing companies with their legacy contracts and market power react if they do. The greatest unknown is not whether the technology will work—I'm confident that it will—but whether the people who listen to music actually care about any of this. (para. 34)

One potential concern audiences may have is with the very transparency the blockchain promises. Listeners do not want their listening habits, let alone their purchasing habits, to be universally visible. To this end, people like Heap (quoted in Howard, 2015a) promise an eventual "clever layer of opacity . . . at the final payment end to protect the identities of the digital wallets' owners" (para. 23).

If all these stakeholders could be brought into alignment, they would still need to make difficult collective decisions about terms and how those terms will be enforced. Rogers' ideal of "minimum viable metadata" requires that stakeholders decide "as an industry" "what data is crucial around a copyright" (Rogers, 2015, para. 2). What is "crucial" may be among the easiest decisions to make. What is "fair" is far more complex. "The concept of 'fair' is fraught," writes Dubber (2016), and "the ethical and political dimensions of a Blockchain solution need some pretty thorough working out" (para. 7). For instance, what are fair ways to ensure accurate metadata? Who would have authority to write to what is in theory an unowned platform? Who would have the authority to resolve conflicts over what is written? What would be the appeals process? The optimists envision a technology in which everyone has power to write to the chain, effectively self-publishing music, but even as this empowers people to ensure their own accurate information and terms, it opens the door to mistaken and malevolent entries of untrustworthy contributions by others. Even as Howard (2015e) suggests that "blockchain technology could help solve what I believe to be the fundamental issue for today's creator—be they a musician, writer, visual artist, etc.—attribution" (para. 3), he grants that "neither blockchain/Bitcoin technology nor anything else is remedying the problem of attribution for what is being entered on the ledger" (para. 5). "Whatever the standard should be" for addressing fraudulent entries, the venture capitalist Bill Tai told Howard, "it has not arrived yet" (Howard, 2015e, para. 33).

The immutable smart contracts envisioned in the dream also raise social challenges. What if standards of fairness are too mutable to be automated? Technology and law scholar Karen Levy (2017) has pointed out that the idea of smart contracts fundamentally misunderstands how legal contracts are rooted in social contexts. As Graham (2015) argued,

> the idea that there will be a magical wonderland of machine logic that will always know how to handle every given situation is laughable. Machines do not understand intent, and they do not understand abstractions like fair use, parody, or pastiche. Humans barely understand these ideas. On the scale that things like user-generated content are created, the idea that this can all be handled in this manner is illogical. (para. 22)

Furthermore, Graham continued, business logic itself is neither logical nor immutable, so writing it into permanent blocks will raise problems of its own. "Rates, terms, use, and even ownership can change at any given moment," he argued, and

> there are not simply market forces at play, but there are emotional forces at play. It is one of those ideas that on the surface sounds brilliant, but without any real thought as to what comes afterwards as far as resolution conflict and other complications that are products of people. (para. 19)

Music might learn from the first attempt at running a full-fledged blockchain-based decentralized autonomous organization, which failed for both technical and social reasons (DuPont, 2017). The development of the blockchain in itself has social problems to contend with. Its decentralization and lack of structure, key to its appeal as a convening technology, have led to slow and halted development, particularly the Ethereum blockchain (De Filippi & Wright, 2018).

The optimists in this conversation acknowledged the issues and soldiered on, confident that when they get the technology working and enough people on board, they will create meaningful change:

> What I have outlined . . . is pretty hard to pull off. It requires a lot of people to get on the same page and the acceptance of some principles that are considered anathema to those who profit from the obfuscation and confusion around payments, transparency, and inaccurate data. On the tech side, however, it's not as hard as it sounds. (Rogers, 2015, para. 29)

Proponents may envision a to-be-determined procedure for sorting out conflicts, perhaps through collective votes of content creators (Heap quoted in Howard, 2015e) or offline through other channels entirely (Rogers quoted in Mas, 2016). Even the skeptics are not without hope. Despite his warnings about unicorns and rainbows, Graham (2015) ends his post on the enormity of the social challenges facing the music blockchain with the optimistic note that the "remarkable value and power in the ideas behind blockchain . . . require a great deal of cooperation and a bit of handholding, and some patience" (para. 43).

Waking From the Dream

We began with four events that encapsulate the blockchain vision and the responses to it: Wallach's *Wired* article, Heap's development of Mycelia, the Rethink Music and Open Music Initiative workshops, and the rise of Dot Blockchain Media, tracing the radical dreams, incorporative ideas, and deep skepticism raised. Rather than painting simple contrasts between hopes and fears, the discourse evolved rapidly into nuance as people, brought together by the ideal of blockchain disruption, began concretely imagining how it could happen. The problems, and the solutions, were identified.

By the end of 2017, all four of the events with which we began reached a more settled, less mythical, and likely more effective approach to thinking about blockchain and music. As the social problems became disentangled from the technological ones, people moved from idealistic optimism that

blockchain could be an all-purpose solution toward a more balanced set of efforts to take on smaller pieces of problems that technology could solve. Many of these early innovators scaled back their goals.

Wallach, whose article helped launch the discussion, reflected his hope a year later

that we will start seeing some usable stuff coming out of this. But you have to zoom out and look at technology from a ten-year or twenty-year time scale. And we are just at the very beginning of this, hopefully. (quoted in Howard, 2015f, para. 80)

A year after Heap's "Tiny Human" experiment, her blockchain collaborators, Ujo Music, posted a mea culpa of sorts, writing, "We want to solve all of your problems. We really do. But we are but a few bright-eyed technologists with a special hammer, looking for the right nail" (Ujo Music, 2016, para. 3).

The Berklee College of Music's Rethink Music effort (launched originally with the Berkman Klein Center for Internet and Society at Harvard) became the nonprofit Open Music Initiative (allied with MIT's Media Lab). As they describe on their website, open-music.org, the Open Music Initiative seeks to create "an open-source protocol for the uniform identification of music rights holders and creators." They describe this "open and interoperable digital rights management platform" not as a blockchain, but as "blockchain-inspired" (MIT, n.d.).

Rogers, who declared in late 2015 that he wanted "2016 to be the year that we do not discuss payouts ever again" (Howard, 2015h, para. 1), and a few months later that "if we leave 2017 and we don't have global decentralization of rights then the entire industry has failed" (Mas, 2016, para. 39), was singing a more modest tune by the end of 2016. Dot Blockchain Media would table smart contracts for now, unsure "whether the technology is at a scale to facilitate the millions of transactions a day" (Mas, 2016, para. 34). "If all we do is establish a data standard," Rogers told the *Huffington Post*, "if all we got was the ownership right, then we've done a lot" (Pollack, 2016, para. 39).

A "Convening Technology"

The shift from "blockchain" to "blockchain-inspired" is telling, and it speaks to the central claim of this article. To use Swartz's (2017) terminology, what began as a "radical," utopian panacea encountered nuanced discussions of social challenges and, as a result, became "incorporative," a far less ambitious, far more achievable, and potentially useful set of plans that might never have existed without the radical visions that inspired discussion.

The case of the blockchain helps to surface social uses of technological solutionism even when— perhaps primarily when—the technologies in question are unable in their current forms to live up to the full potential envisioned in the hype. In the music industry, blockchain functions as a "convening technology" that provided the context for literal convening—all those workshops, conferences, summits, and hackathons—around the future of the music industry. It brought people together and marshalled resources,

including capital and legitimacy. It is an ongoing process that converts dreams into actions, even as—and this is key—those actions ultimately have little to do with the blockchain, the initial pretext for convention.

Barnett (2008), in his theory of convening publics, notes that, beyond simply "gathering" or "assembling," convening implies a "calling out to others, attracting their attention," which in turn "requires an active response to heed any such call" (p. 411). It is tempting to discount blockchain-based projects when they depend on hyperbolic, utopian discourse, but this very hyperbole works to "construct utopian tales about these technologies to render them socially meaningful and to mobilize large-scale support" (Iacono & Kling, 1996, p. 2). The blockchain is much-hyped, but hype is a mechanism of attention, of calling out, of invitation.

Convenings around the blockchain have been held at institutions like the Berklee College of Music, MIT, and Harvard, each of which represents and conveys a different kind of legitimacy and prestige—in music, technology, and business and law, respectively. Blockchain has brought important stakeholders (including key actors in industry, such as the major rights organizations and record labels) to the table alongside independent artists, activists, and technologists. As Heap (2017) observed in the *Harvard Business Review*, "Berklee's Open Music Initiative have [sic] managed to gather almost every party under the industry-wide sun to explain why blockchain is at least worth exploring and engaging with" (para. 10). In a field long characterized by distrust and competition, this is itself a significant contribution to addressing the social problems that beset the music industry and is demonstrative of the power of blockchain, as a convener, to create social change. As a framing device, the blockchain helped to surface and connect long-standing dissatisfactions artists and rights holders have had with the intermediaries and systems that distribute and compensate them for their work. Indeed, the blockchain's main contribution to the music industry might just be the conversation it has generated.

Our analysis here resonates with that of anthropologist Hannah Appel, who found in the Occupy movement "conditions of possibility for a certain kind of imaginative work in the dense and seemingly definitive spaces of financial expertise" (Appel, 2014, p. 603). Appel uses an eclectic set of theorists, including Hannah Arendt and Milton Friedman, to describe how the Alt Finance working group and other Occupy sites produced what Arendt called a "space of appearance"—that is, one of those temporary spaces, full of potential, performed through coming together, acting and speaking collaboratively. In this space of appearance, members of the Occupy working group came together to imagine what an alternative economic system might look like. They brought with them stray but concrete ideas that had been simmering, ideas that are "lying around" until the "politically impossible becomes politically inevitable" (Appel, p. 614). For Appel, this stewardship of ideas, this comparing of notes, is essential for imagining a different future. It is the lists and the conversation that keeps them from being "marooned between wishful thinking and reflexive debunking" (p. 619).[1]

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[1] In some ways, the blockchain moment for music is a post-Occupy phenomenon. After all, blockchain came out of Bitcoin, the diffusion of which, both as an idea as much as an actual currency, was fueled by the same frustration with institutions in the wake of the global financial crisis that fueled Occupy (Castells, 2012; Maurer, Nelms, & Swartz, 2013). But perhaps more important here than actual historical coincidence is the way that both Occupy and blockchain have created a "space of appearance" that opens up the economic

Like Appel and the Occupiers she describes, and like the music industry stakeholders we observe, we have sought in this article to find a way between "wishful thinking and reflexive debunking," between technological utopianism and dystopianism. With the blockchain in the music industry, the utopian mythos are a starting point: tales being told before the technology even exists. But the blockchain discourse contains its own critique. It is a particular kind of "idea lying around," one that takes the form of a specific technology. Blockchain may be a speculative, perhaps even imaginary, technology, but its nearness and specificity demand implementation, or at least the thinking through of implementations. Instead of just speculative near-future fiction, blockchain becomes a concrete "working artifact" (Suchman, Trigg, & Blomberg, 2002).

An only-just-emerging technology such as blockchain is futuristic and thus can animate creative problem solving. Offering what Swartz (2016) calls the "aura of the radical," such technologies can ignite optimism for radical change. Because such optimism refers, even if only in gestures, to technology that sort of exists, it roots conversation in practical terms. Because the solutions are presented as technological and near-future, it can do so without pointing fingers of blame at anyone in particular.

The blockchain in the music industry seems to offer technological solutions to problems at least as social as they are technical, but ultimately, thinking through together can reveal that problems were always social to begin with, and their solutions can only involve the technical alongside the social. Imagining a future with a convening technology aligns a "practice of configuring new alignments between the social and the material that are both localized and able to travel, stable and recognizable, intelligibly familiar, and recognizably new" (Suchman et al., 2002, p. 164). By convening a conversation that shifts from an imagined technology to an admission and clearer articulation of human problems, the seemingly utopian morphs from a transformative, solve-it-all solution into a human approach that works within social structures even as it hopes to transform them.

Limits to Convening Technologies

New technologies may be convening, but it is not something that just happens. The technology inspires, but the people do the convening in its resonance, and they do so according to priorities, values, and assumptions. What are the consequences, then, of a convening technology?

As Barnett (2008) emphasized, convening publics depend on "thinking publicly" (p. 25) and asking critical questions about who is called, according to what sorts of processes, and with what outcomes. Similarly, Steven Duncombe (2007), while promoting the idea of critical utopianism (albeit not necessarily technological utopianism), nevertheless emphasizes the need to imagine not just a spectacle of a desired future, but an "ethical spectacle." Mike Ananny (2016) highlights the ethical dimensions of convening through and by technologies—in his case, algorithms. While mechanics of being called to convene through

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imagination and allowed discussion of ideas that had been otherwise "lying around." (And, indeed, Bitcoin was quite literally one of Friedman's ideas that had been lying around. In 1999, he suggested the need for a secure, anonymous, freely flowing "eCash." Of course, he wasn't the only one. (See Brunton, in press; Swartz, 2018).

aggregation by algorithms are quite distinct from the mechanics of being called to convene through (or perhaps by) something like the idea of a blockchain, we are prompted to inquire after what might constitute an ethics of convening technologies.

Perhaps foremost, it is important to ask, as Barnett (2008) suggests, who gets called to convene?[2] Any convening necessarily entails implicit or explicit decisions of "Who is inside and outside, who may speak, who may not, and who has authority and may be believed" (Marvin, 1990, p. 4). The conversations recounted in this article may have included a breadth of participants not often talking together, but, as with any conversation, other voices were not invited, did not attend, and may have had visions more radical, less technological, and equally valid.

The projects envisioned and described here contributed to the building of a new public as actors assembled to name, discuss, and fix the problems blockchain held out promise of addressing. The technological dreams were scaled back as the scope of social challenges to technological solutions became clearer. The blockchain conversation convened around a technology, and the efforts put forth to scaffold that technology became a means of creating some social change. One can only wonder what it might look like were that same kind of energy put forth into scaffolding the social change that solving all the problems at hand will ultimately require.

Whether the music industry's investment of time, energy, intellectual power, and capital in blockchain will pay off or it if will stand as "just another sad fairy tale for the music industry, and a fantastical solution to chronic problems of dishonesty and non-transparency" (Resnikof, 2016, para. 11) is yet to be determined. But the convening power of an idea can nonetheless serve as an authorizing force for change. The public crafted through the conversation the blockchain convened has already proven meaningful, even if the blockchain itself has not.

References

Ananny, M. (2016). Toward an ethics of algorithms: Convening, observation, probability, and timeliness. *Science, Technology, & Human Values*, *41*(1), 93–17.

Appel, H. (2014). Occupy Wall Street and the economic imagination. *Cultural Anthropology*, *29*(4), 602–625.

Arcand, R. (2017, September 7). Is blockchain technology the future of music streaming? *Watt.* Retrieved from https://watt.cashmusic.org/writing/blockchain

Barnett, C. (2008). Convening publics: The parasitical spaces of public action. In K. R. Cox., M. Low, & J. Robinson (Eds.), *The SAGE handbook of political geography* (pp. 403–418). London, UK: SAGE Publications.

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[2] We are indebted to Larissa Mann for crystallizing this question.

Bartlett, J. (2015, September 6). Imogen Heap: Saviour of the music industry? *Guardian*. Retrieved from
        http://www.theguardian.com/music/2015/sep/06/imogen-heap-saviour-of-music-industry

Brunton, F. (in press). *Digital cash.* Princeton, NJ: Princeton University Press.

Castells, M., Caraça, J., & Cardoso, G. (Eds.). (2012). *Aftermath: The cultures of the economic crisis*.
        Oxford, UK: Oxford University Press.

Dale, B. (2015, September 10). Block chain-powered used digital music stores would profit musicians.
        Observer. Retrieved from http://observer.com/2015/09/block-chain-powered-used-digital-music-
        stores-would-profit-musicians/

De Filippi, P. D., & Wright, A. (2018). *Blockchain and the law: The rule of code*. Cambridge, MA: Harvard
        University Press.

de Vries, A. (2018). Bitcoin's growing energy problem. *Joule*, *2*(5)*,* 801–805. Retrieved from
        https://clickonyx.co.uk/wp-content/uploads/2018/05/PIIS2542435118301776.pdf

Dovey, M. (2015, September 24). *Creativity on the blockchain* [Web log post]. Retrieved from
        http://networkcultures.org/moneylab/2015/09/24/creativity-on-the-blockchain/

Dredge, S. (2015, July 14). Could blockchain technology solve streaming music's payment rows? *Guardian*.
        Retrieved from https://www.theguardian.com/technology/2015/jul/14/bitcoin-blockchain-streaming-
        music-payment-rows

Dredge, S. (2016, September 6). From YouTube to the blockchain: How music and tech are colliding in 2016.
        Guardian. Retrieved from https://www.theguardian.com/technology/2016/jun/09/youtube-
        blockchain-music-tech-apple-google

Dubber, A. (2016, May 16). *Blockchain: Navigating the minefield* [Web log post]. Retrieved from
        https://blog.midem.com/2016/05/blockchain-navigating-the-minefield/

Duncombe, S. (2007). *Dream: Re-imagining progressive politics in an age of fantasy*. New York, NY: New
        Press. Retrieved from http://www.stephenduncombe.com/dreampolitik/

DuPont, Q. (2017). Experiments in algorithmic governance: An ethnography of "the DAO," a failed
        decentralized autonomous organization. In M. Campbell-Verduyn (Ed.), *Bitcoin and beyond: The
        challenges and opportunities of blockchains for global governance* (pp. 157–177). New York, NY:
        Routledge.

DuPont, Q., & Maurer, B. (2015, June 23). Ledgers and law in the blockchain. *Kings Review.* Retrieved from
        http://kingsreview.co.uk/articles/ledgers-and-law-in-the-blockchain/

Ensmenger, N. (2015, October). *The environmental history of computing*. Keynote address to the Special Interest Group Computers, Information and Society of the Society for the History of Technology, Albuquerque, New Mexico. Retrieved from https://www.sigcis.org/workshop15

Fairfield, J. A. (2014). Smart contracts, bitcoin bots, and consumer protection. *Washington and Lee Law Review Online*, *71*(2), 35–36.

Gerard, D. (2017). *Attack of the 50 foot blockchain: Bitcoin, blockchain, Ethereum & smart contracts*. North Charleston, SC: CreateSpace.

Graham, A. (2015, August 20). *Understanding music and blockchain without the hype*. [Web log post]. Retrieved from https://thetrichordist.com/2015/08/20/understanding-music-and-blockchain-without-the-hype-2/

Heap, I. (2015, October 5). I'm Imogen Heap. And this is why I'm releasing my music on Blockchain. *Digital Music News.* Retrieved from http://www.digitalmusicnews.com/2015/10/05/im-imogen-heap-and-this-is-why-im-releasing-my-music-on-block

Heap, I. (2017, June 5). Blockchain could help musicians make money again. *Harvard Business Review*. Retrieved from https://hbr.org/2017/06/blockchain-could-help-musicians-make-money-again

Howard, G. (2015a, April 26). Imogen Heap gets specific about Mycelia: A fair trade music business inspired by blockchain. *Forbes*. Retrieved from http://www.forbes.com/sites/georgehoward/2015/07/28/imogen-heap-gets-specific-about-mycelia-a-fair-trade-music-business-inspired-by-blockchain

Howard, G. (2015b, May 22). Bitcoin can't save the music industry because the music industry will resist transparency. *Forbes.* Retrieved from http://www.forbes.com/sites/georgehoward/2015/05/22/bitcoin-cant-save-the-music-industry-because-the-music-industry-will-resist-transparency/#687b863834bd

Howard, G. (2015c, June 5). Bitcoin and the arts: An interview with artist and composer, Zoe Keating. *Forbes.* Retrieved from http://www.forbes.com/sites/georgehoward/2015/06/05/bitcoin-and-the-arts-and-interview-with-artist-and-composer-zoe-keating

Howard, G. (2015d, July 17). Imogen Heap's Mycelia: An artists' approach for a fair trade music business, inspired by blockchain. *Forbes*. Retrieved from http://www.forbes.com/sites/georgehoward/2015/07/17/imogen-heaps-mycelia-an-artists-approach-for-a-fair-trade-music-business-inspired-by-blockchain

Howard, G. (2015e, August 27). Blockchain as the source-DNA for content attribution: A conversation with Bill Tai—Part 1. *Forbes.* Retrieved from

http://www.forbes.com/sites/georgehoward/2015/08/27/blockchain-as-the-source-dna-for-content-attribution-a-conversation-with-bill-tai-part-1

Howard, G. (2015f, September 25). "Bitcoin for rock stars" a year later: An update from D. A. Wallach on blockchain and the arts—Part 1. *Forbes.* Retrieved from http://www.forbes.com/sites/georgehoward/2015/09/25/bitcoin-for-rock-stars-a-year-later-an-update-from-d-a-wallach-on-blockchain-and-the-arts-part-1/

Howard, G. (2015g, September 27). What the music business could learn from the Internet of things. *Forbes.* Retrieved from http://www.forbes.com/sites/georgehoward/2015/09/27/what-the-music-business-could-learn-from-the-internet-of-things/

Howard, G. (2015h, December 17). Benji Rogers' .bc Codec: A fair trade approach to music and virtual reality using the blockchain. *Forbes.* Retrieved from http://www.forbes.com/sites/georgehoward/2015/12/17/benji-rogers-bc-codec-a-fair-trade-approach-to-music-and-virtual-reality-using-the-blockchain

Howard, G. (2016, January 28). PRS for Music CEO, Robert Ashcroft, discusses challenges and innovations in music collection. *Forbes.* Retrieved from http://www.forbes.com/sites/georgehoward/2016/01/28/prs-for-music-ceo-robert-ashcroft-discusses-challenges-and-innovations-in-music-collection/

Iacono, S., & Kling, R. (1996). Computerization movements and tales of technological utopianism. In R. Kling & C. Dunlop (Eds.), *Computerization and controversy: Value conflicts and social choices* (pp. 85–105). New York, NY: Academic Press.

Ingram, M. (2015, November 27). Using the blockchain to reinvent the music business. *Fortune.* Retrieved from http://fortune.com/2015/11/27/blockchain-music/

International Federation of the Phonographic Industry. (2015, July 17). *IFPI response to the Berklee College report*. Retrieved from https://www.ifpi.org/news/IFPI-response-to-the-Berklee-report

Katz, J. E., & Rice, R. E. (2002). *Social consequences of Internet use: Access, involvement and interaction.* Cambridge, MA: MIT Press.

Lahr, J. (2015, November 16). *Transparency, accounting and the creation of a fair music report*. Retrieved from http://www.hypebot.com/hypebot/2015/11/a-fair-music-report.html

Levy, K. E. (2017). Book-smart, not street-smart: Blockchain-based smart contracts and the social workings of law. *Engaging Science, Technology, and Society*, *3*, 1–15. Retrieved from https://estsjournal.org/article/view/107

Marvin, C. (1990). *When old technologies were new: Thinking about electric communication in the late nineteenth century*. Oxford, UK: Oxford University Press.

Mas, C. (2016, April 5). *Blockchain broken down for the music industry, with Benji Rogers* [Web log post]. Retrieved from http://blog.midem.com/2016/04/blockchain-broken-music-industry/

Maurer, B., Nelms, T. C., & Swartz, L. (2013). "When perhaps the real problem is money itself!": The practical materiality of Bitcoin. *Social Semiotics*, *23*(2), 261–277.

Milosic, K. (2015, August). GRD's failure. *Music Business Journal*. Retrieved from http://www.thembj.org/2015/08/grds-failure/

Morris, J. (2014). Artists as entrepreneurs, fans as 2orkers. *Popular Music and Society, 37*(3), 273–290.

Nye, D. E. (2004). *America as second creation: Technology and narratives of new beginnings*. Cambridge, MA: MIT Press.

MIT. (n.d.). *Open music initiative*. Retrieved from https://www.media.mit.edu/projects/open-music-initiative/overview/

O'Dair, M., & Beaven, Z. (2017). The networked record industry: How blockchain technology could transform the record industry. *Strategic Change*, *26*(5), 471–480.

Pollack, J. (2016, February 24). Big Bang XV: Paid is the new free. *Huffington Post.* Retrieved from https://www.huffingtonpost.com/jeff-pollack/big-bang-xv-paid-is-the-n_b_9310454.html

Rethink Music. (2015, October 2). *Fair Music workshop*. Retrieved from http://www.rethink-music.com/events/rethink-music-2015

Resnikof, P. (2016, January 19). Bitcoin: Just another industry fairytale? *Digital Music News*. Retrieved from https://www.digitalmusicnews.com/2016/01/19/bitcoin-has-totally-failed-says-a-top-bitcoin-engineer/

Richter, C., Kraus, S., & Bouncken, R. B. (2015). Virtual currencies like Bitcoin as a paradigm shift in the field of transactions. *The International Business & Economics Research Journal (Online)*, *14*(4), 575.

Rogers, B. (2015, November 23). How the blockchain and VR can change the music industry. *Medium.* Retrieved from https://medium.com/cuepoint/bc-a-fair-trade-music-format-virtual-reality-the-blockchain-76fc47699733

Rys, D. (2016, March, 19). Transparency and Data Problems Hotly Debated During First Week of SXSW 2016. *Billboard.* Retrieved from https://www.billboard.com/articles/events/sxsw/7263914/transparency-and-data-problems-hotly-debated-during-first-week-of-sxsw

Suchman, L., Trigg, R., & Blomberg, J. (2002). Working artefacts: Ethnomethods of the prototype. *The British journal of sociology*, *53*(2), 163–179.

Swartz, L. (2017). Blockchain dreams: Imagining techno-economic alternatives after Bitcoin. *Another economy is possible* (pp. 82–105). Cambridge, UK: Polity Press.

Swartz, L. (2018). What was Bitcoin, what will it be? The techno-economic imaginaries of a new money technology. *Cultural Studies*, *32*(4), 623–650.

Sweeting, P. (2016, March 31). The accidental blockchain evangelist. *Rights Tech*. Retrieved from https://rightstech.wordpress.com/2016/03/31/the-accidental-blockchain-evangelist/

Ujo Music. (2016, August 29). *Emerging from the silence* [Web log post]. Retrieved from https://blog.ujomusic.com/welcome-back-1addcc06bcc6

Wallach, D. A. (2014, December 10). Bitcoin for Rockstars. *Wired.* Retrieved from https://www.wired.com/2014/12/bitcoin-for-rockstars/

Wikström, P. (2013). *The music industry: Music in the cloud*. Cambridge, UK: Polity Press

Zeilinger, M. (2018). Digital art as 'monetised graphics': Enforcing intellectual property on the blockchain. *Philosophy & Technology*, *31*(1), 15–41.

Zimmer, Z. (2017). Bitcoin and potosí silver: Historical perspectives on cryptocurrency. *Technology and culture*, *58*(2), 307–334.