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The Future of Blockchain Technology in the Music Industry

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Introduction

Blockchain technology is being discussed as a revolutionary force in many industries. Perhaps not since the advent of the Internet itself has a single technology buzzword captured the imagination of so many. The music industry is no exception: many music tech startup companies, R&D groups in existing companies, and venture investors are touting the promise of blockchain technology for music. Meanwhile, skeptics say that blockchain cannot possibly live up to all the hype it's generating nowadays.

In this article, we'll explain the basics of blockchain technology; then we'll evaluate proposed applications of the technology to music mainly by addressing the question of whether it solves a known, current pain point or meets a current need. This criterion derives from the theory of technology market development originally propounded in the 1990s by Geoffrey Moore.[1] In essence, the theory says that a fundamentally new technology has to be packaged in complete solutions to known problems in order to gain a foothold in the market. Only after the market accepts those solutions can the technology go "horizontal" and reach the mainstream.

To evaluate the impact of any technology on the music industry, it's useful to break the industry down into two categories: B2B (business-to-business) and B2C (business-to-consumer). The B2B realm spans everything from a composer or performer creating music to the music getting to a service that will distribute it to the public. B2C covers the ways in which those services make the music available to users.

As we'll see in this article, the most likely applications of blockchain technology to music are in the B2B realm, where it has the potential to solve some of the problems of efficiency and accountability in rights management and royalty payments that are plaguing the industry today. In contrast, the blockchain technology applications that are being discussed for B2C music generally address problems that have already been solved without blockchains, that blockchain technology is not likely to solve, or that the market has determined are not worth solving. Yet even the B2B applications of blockchain technology to music are predicated on several factors: cooperation across multiple industry factions, overcoming fundamental limitations in the technology, and unavailability of other solutions to the known problems.

Proposals for blockchain applications for music and other forms of intellectual property have come from all over the place; perhaps the best single summary is a paper written in May 2016 by the think tank COALA (Coalition of Automated Legal Applications).[2]

What's a Blockchain?

A blockchain is a type of distributed database—a ledger of transactions that isn't owned by any single entity. Instead, every entity that participates in a blockchain has a copy of it that is guaranteed to be complete at any given time. Figure 1 shows a generic example of a blockchain.

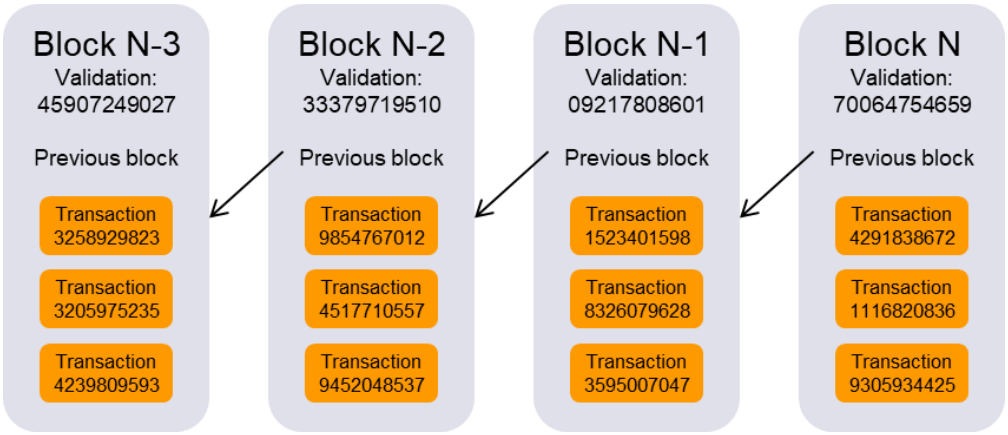

Figure 1: An example of a generic blockchain that contains multiple transactions, pointers to previous blocks in the chain, and data used to validate the block.

It's only possible to add transactions to a blockchain; once there, they can't be altered or removed. When a process wants to add data to a blockchain, it constructs a block of data and appends it to the blockchain with a link. Then a protocol runs to validate the data in the new block. This typically involves other entities performing complex mathematical and cryptographic calculations on the data to validate it. The data is considered valid once a sufficient number of entities has agreed on its validity as a result of those calculations; details vary from one scheme to another. The entities performing the validation need sufficient incentives to do it correctly.

The most widely-known blockchain is the blockchain for the Bitcoin cryptocurrency; but just as there can be an infinite number of databases, there can be arbitrarily many blockchains. Blockchains can be public or private, and entities that post data onto blockchains can be known or anonymous. It all depends on the requirements of the application.

Many ancillary technologies are associated with blockchains; one that's particularly relevant to this discussion is *smart contracts*. A smart contract is (in this case) a set of rules or instructions that run on a blockchain automatically, such that the rules are guaranteed to be applied to all nodes in a blockchain. The Ethereum blockchain is known for its support of smart contracts.

B2B Applications: Rights and Royalty Processing

First we will look at B2B applications of blockchain technology for music. Whenever a songwriter creates a composition, or when a performing artist performs one, data and processes also get created that result in the work being used and (in many cases) the creator getting paid for those uses.

Currently, those processes are managed by an ad-hoc collection of laws and entities that have evolved over the past couple of centuries and continue to evolve with new technologies. Before the digital age, those processes were relatively straightforward: for example, a musician performs a composition in public, and the composer gets paid; or a musician records a composition and (through a record label) sells physical copies of the recording; the recording artist and the composer both get paid for each copy sold.

In the digital age, many variations on these themes have been proliferating along with innovations in distribution models such as downloaded digital files (iTunes, Amazon MP3), noninteractive streaming (Pandora, iHeartRadio), and paid subscription services (Spotify, Apple Music). Each of these innovations has engendered more rights management and royalty payment schemes. Accordingly, the entities that govern rights and royalty processes are becoming more numerous, and the data they handle is constantly becoming more complex. The increased size and complexity inevitably lead to more errors, omissions, misunderstandings, and disputes.

To explain this, we'll start with the basics of copyright law as it applies to music. Each track of recorded music has two copyrights: one for the composition (created by a composer or songwriter), the other for the sound recording of that composition (created by a recording artist). The sound recording is said to *embody* the composition; conversely, the composition is said to *underlie* the recording. "Composition" is something of an abstract notion; it's easiest to think of it as the written music plus lyrics, if any.

Compositions are administered by *music publishers*, while sound recordings are usually (though not always) administered by *record labels*. Typically, music publishers and record labels own rights and collect portions of royalties on the copyrighted works. The simplest example is a singer-songwriter who creates both the composition and the sound recording: Bruce Springsteen wrote and recorded "Born to Run"; he published the song through his own music publisher (Bruce Springsteen Publishing) and distributed the sound recording through his record label (Columbia).

In today's pop music world, there are often several songwriters for each composition, and they agree on percentages of royalties called *splits*. Each of these songwriters could have a different music publisher. This is especially the case if a composition contains excerpts or samples from other compositions. For example, Drake's hit song "Nice for What" has over 20 composers. In addition, several people could get royalty credit for a sound recording, including the producer and so-called *featured artists*.

Under copyright law (17 U.S.C. § 106), copyright owners get a set of exclusive rights to their works. They can license these to various copyright users, such as digital music services – which are known generically as *Digital Service Providers* or DSPs. The most relevant rights for this discussion are public performance (live for an audience or or a recording of the song played on the radio or streaming service), reproduction, and distribution. By industry convention, reproduction and distribution rights for compositions are bundled into a single right called a *mechanical*.[3]

So, both composition and sound recording copyright owners have performance and reproduction/distribution rights. In theory, that means that four royalty payments are required whenever someone plays a recording of the composition through a DSP. As we'll see, this is true for some but not all cases. This is shown in Figure 2.

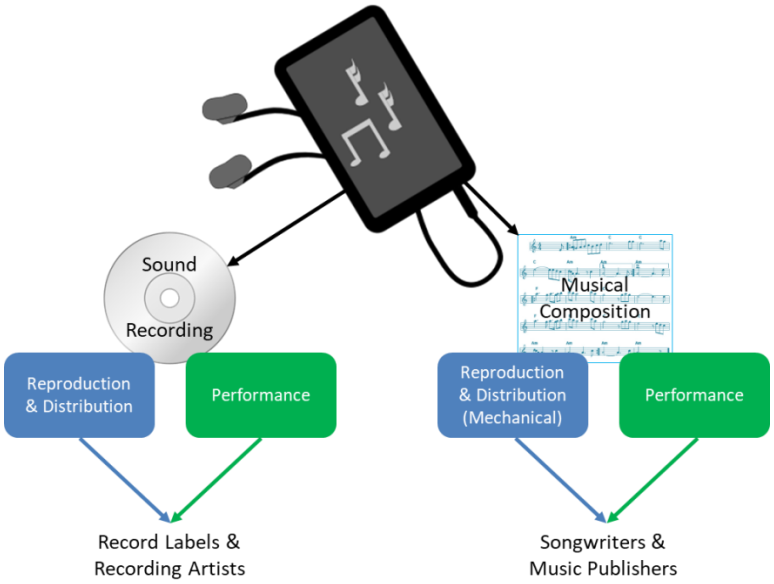

Figure 2: The four basic licensed rights for recorded music.

Organizations have emerged over time that process these royalties on behalf of multiple rights holders. Some of these are known as *collecting societies* or *collective rights management organizations*; these have bargaining power over royalty rates and in some cases have gotten antitrust exemptions in order to operate. Other such organizations can be thought of as back-office paperwork processors for rights holders; they hold no bargaining power and own no rights.

On the composition side, *Performing rights organizations (PROs)* are collecting societies that handle performance royalties. In the United States, these are ASCAP, BMI, SESAC, and Global Music Rights (GMR). Each music publisher and each composer belong to one of these.[4] There are also *mechanical rights organizations (MROs)* that process mechanical royalties, such as the Harry Fox Agency (HFA), owned by SESAC. Finally, there are *publishing administrators* that manage royalties for music compositions (and take fees for doing so) but do not own any copyrights, such as Kobalt and Songtrust. Publishing administrators work with PROs and MROs (among others).

All of these organizations tend to serve smaller music publishers but typically not the major publishers such as Universal Music Publishing Group, Warner/Chappell, and Sony/ATV (divisions of Universal Music Group, Warner Music Group, and Sony Entertainment respectively). The majors tend to make licensing deals with DSPs directly. Many of the royalties on musical compositions are set by statute, such as 17 U.S.C. § 115 for mechanicals.

On the sound recording side, record labels typically own sound recording copyrights – known as *master rights* -- outright. Exceptions to this include some big-name artists who retain ownership of their copyrights, independent artists without labels, and artists who record on the small labels that let artists retain copyright ownership. The major labels generally make direct deals with DSPs; these deals tend to cover specific types of digital performances and reproductions, such as paid permanent downloads (a la iTunes), time-bounded downloads, paid subscription streams, or ad-supported streams.

The only collecting society for sound recordings in the United States is a nonprofit company called SoundExchange, which administers royalties for performances of sound recordings on digital radio services such as Pandora, iHeartRadio, and Sirius XM under the 17 U.S.C. § 114 statutory licenses. Finally, there are organizations on the sound recording side that are analogous to publishing administrators on the composition side: so-called *indie aggregators* handle digital licensing for sound recordings, either for small independent labels (such as The Orchard, INgrooves, and FUGA) or for independent artists (such as TuneCore, CD Baby, and Symphonic).

The following figures show some of the most important of the many different content and money flows in digital music.[5] The following are explanations of "typical" flows, not counting direct publisher or label deals as described above.

Figure 3 depicts the flows for musical compositions, involving songwriters and publishers, from most types of DSPs (with differing royalty amounts for different service types). In this process, a DSP has a catalog of recordings available, each of which embodies a composition.[6] When the DSP delivers a recording to a user (whether by download or stream), the DSP pays a mechanical royalty to an MRO and a performance royalty to a PRO on the underlying composition; both of them pass along shares of those royalties to the publisher. The publisher pays the songwriter(s) shares of each of the two royalties.

Figure 4 shows the flows for sound recordings, involving recording artists and labels, from digital music download services such as iTunes. In this case, the music service pays a royalty to a record label for each track that a user downloads. The label passes mechanical royalties to the publishers of the underlying composition (as above) and pays a percentage of the remainder to the recording artist.

Figure 5 shows the flows for sound recordings from interactive streaming DSPs such as Apple Music, Spotify, and Amazon Music Unlimited. The flow is similar to the download scenario in Figure 4, except that the interactive stream counts as a performance of the underlying composition (as well as a digital performance of the sound recording), so the DSP must pay a performance royalty to the relevant PRO as well as to the record label.

Figure 6 shows the flows for noninteractive music services, which pay sound recording performance royalties to SoundExchange (the Sound Recording PRO) as described above.[7]

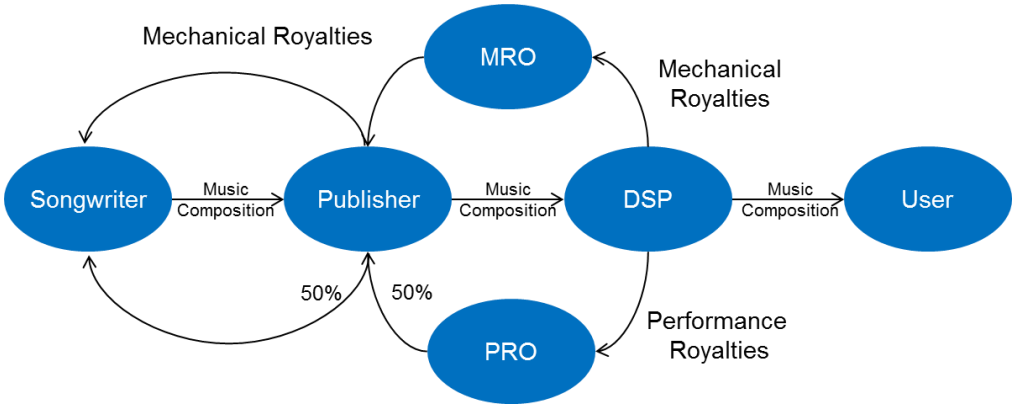

Figure 3: Typical musical composition royalty flows from digital music service providers.

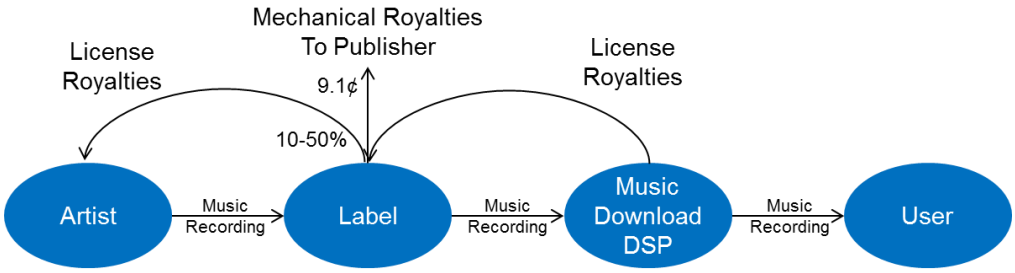

Figure 4: Typical sound recording royalty flows from digital music download services.

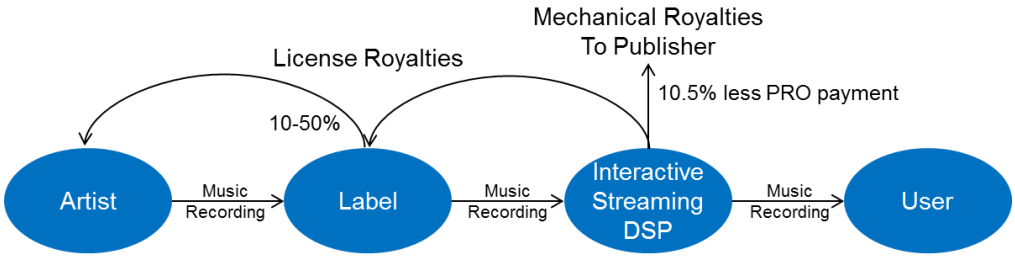

Figure 5: Typical sound recording royalty flows from interactive streaming services. (2017 Rates)

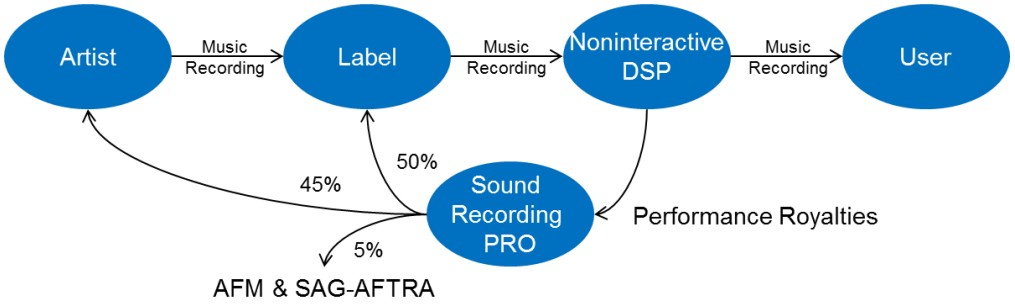

Figure 6: Typical sound recording royalty flows from noninteractive (radio-like) streaming services.

This should give some idea of the number and complexity of transactions that must occur, and the number of entities involved, whenever a DSP plays or downloads a music track for a user. Each play or download involves two distinct sets of rights holders and rights, and various administrators that process licenses and royalties on those rights.

As an additional layer of complexity and ambiguity, there is a perception that some of these royalties are paid to rights holders through estimates of use while others are paid on actual measured use. For all of the primary streaming services, the PROs receive census (100%) reporting of music use and allocate values based on the amount of the services' license fees and the number of songs streamed on the site. No payments are made for compositions under a low performance threshold. Examples of the former include performance royalties on compositions: DSPs pay percentages of revenues to PROs, and the PROs estimate the payouts to each of the rights holders affiliated with them. Examples of royalties that are paid on actual measured use include mechanicals on compositions and performance royalties on sound recordings under the statutory licenses mentioned above.[8]

As these royalty streams proliferate in their number and complexity, there is an increasingly urgent need to track them efficiently and accurately. As the above explanation implies, the different entities involved in rights management and royalty processing comprise – at best – a patchwork solution involving many unrelated proprietary entities and a paucity of reliable publicly available information.

The industry has been looking at various ways of streamlining and rationalizing the system. Some of these involve changing the laws; for example, the Music Modernization Act (which was signed in to law in October 2018) purports to streamline mechanical royalties on compositions for interactive streaming services by, among other things, amending § 115 to provide for blanket licenses instead of requiring track-by-track licensing. But other efforts focus on improving ways to identify and track rights holders and usages, so that the processes can be automated with confidence.

At a minimum, automation of music royalty processes requires two things: that copyrighted works and rights holders can be uniquely and unambiguously identified, and that sound recordings be definitively linked to the compositions they embody. We'll discuss each of these in turn.

Unique and unambiguous identification requires common standard identifiers. A standard unique identifier for sound recordings exists and is widely used among record labels: the ISRC (International Standard Recording Code).[9] Compositions also have standard unique identifiers – ISWCs (International Standard [Musical] Work Codes).[10]

Two different standard identifiers for rights holders are used in the music world. IPI (Interested Party Information)[11] is widely used among PROs to identify holders of rights in musical compositions. A newer standard, ISNI (International Standard Name Identifier),[12] identifies creators, which can also include musicians. These identifiers are essentially redundant, and there is no reason why one rights holder identifier could not be used for all types of music rights holders. ISNIs are not yet widely used, though they are increasing in popularity among singer-songwriters – which indicates that ISNI is "crossing over" from the recording to songwriting domains, whereas the converse is not true for IPI.

DSPs receive feeds of sound recordings and associated information (metadata) from record labels and indie aggregators. Unfortunately, that information does not always reliably identify the compositions underlying the sound recordings.[13] Sometimes labels

don't supply composition rights holder information, and sometimes the information is unavailable.[14]

This is especially problematic for interactive streaming DSPs such as Spotify, Apple Music, Google Play, etc., because they have to pay mechanicals on a per-use basis under the § 115 statutory license. To qualify for the statutory license, they must send rights holders forms called Notices of Intention (NOIs) for each composition. If they can't identify the rights holders, they can send NOIs to the U.S. Copyright Office and put the royalty payments in escrow. These interactive streaming DSPs ingest tens of thousands of music tracks *every day* and must process each of them in this way. (Editor's Note: NOI's will be a thing of the past once the MMA takes full effect.)

The other challenge in automation of royalty payments is linking of sound recordings to their underlying compositions. There is no universal way to reliably link sound recordings to their underlying compositions; there is no public registry or database. There are a few agencies that do this work for DSPs, including HFA, Music Reports Inc., and MediaNet, but they use proprietary methods of finding matching compositions that are not foolproof (because of the fundamental data problems mentioned above). Those services must maintain separate databases for each DSP for these purposes, even though those DSPs' huge catalogs are mostly identical.

Previous industry attempts to solve these problems have focused on creating enormous centralized registries – databases of information about copyrighted works, rights, and rights holders that can be accessed online. There have been over half a dozen major attempts of this nature, most notably the Global Repertory Database (GRD), which began in Europe in 2010 and was shelved after four years and millions of dollars. None of these efforts have succeeded, mainly because of the sheer complexity of gathering all that data in one place and keeping it up to date, the lack of financial incentives, and issues of power and control over the data by a single entity.[15]

Blockchain technology could solve some of these rights management and royalty problems. In the ideal scenario, whenever a user downloads or plays a music track on a DSP, the DSP deposits a record on a semi-private blockchain that's accessible to all interested parties. The record would contain identifiers for the sound recording and composition(s), the DSP, and the type of rights usage (e.g., interactive stream). Each rights holder, collecting society, and administrator would be able to read the record and institute a royalty payment transaction via a smart contract. The records and transactions would be visible to all stakeholders, establishing a permanent paper trail to aid in dispute resolution.

The biggest advantage of a blockchain in this situation is that it would reduce the industry's dependence on closed, proprietary, largely redundant databases and transaction registries. Entities that manage rights and royalties would have less need for their own data repositories. It would be much easier for all parties to communicate with a single entity through a standard interface rather than many different entities with their own interfaces and data requirements; it would facilitate new service providers that increase efficiency; accuracy, and accountability even further; and it would increase rights holders' visibility into royalties that they are owed.

Blockchain technology also eliminates many of the disadvantages of the centralized database approach. No single entity owns a blockchain, so there is no issue of control or influence, though it would still be necessary to design a consensus system for validating transactions that involves stakeholder incentives. The cost of building the enormous

technical infrastructure would also be much lower – blockchains are largely based on open-source technology – and would be spread amongst the participants.

Yet it would certainly be a mistake to think of blockchain technology as a panacea. One of the biggest sources of inaccuracies in current rights management and royalty processing is the classic "garbage in, garbage out" problem: if you start with bad or incomplete data, you get an incorrect result. Blockchain technology will never eliminate the "garbage in" problem. But it can help reduce errors and inconsistencies that result from having to move data in and out of multiple proprietary systems. A blockchain can use data interoperability standards to establish common rules for interfacing data from existing systems (for example, PROs' existing databases) to the blockchain. A project called the Open Music Initiative (OMI) is working on promoting this kind of data interoperability standard.[16]

Aside from that, the biggest obstacle to the use of blockchain technology for this application is scalability. Interactive music streaming alone is in the hundreds of billions of streams per year,[17] which puts the number of royalty transactions into the trillions, and the number is growing rapidly. Even if a blockchain is "limited" to a few thousand nodes (one for each music industry stakeholder – publisher, record label, PRO, etc.), it is nowhere near possible to handle the volume of transactions necessary. The need to replicate each transaction over every node of the blockchain severely limits transaction volume capacity. For example, as of late 2017 the Bitcoin blockchain was estimated at 3.3-7 transactions per second.[18] To put that in perspective, a volume of one trillion annual transactions averages out to over 30,000 transactions per second.

Of course, scalability is bound to improve through a combination of Moore's Law and the innovation made possible by the huge amounts of talent and funding pouring into the blockchain space. Even nowadays it should be possible for a small set of complementary stakeholders to start building decentralized blockchain-based royalty processing solutions at a scale that current technology can handle. A current example of this is the startup dotBlockchain Music, which has been running a pilot project with a PRO (SOCAN of Canada), an indie sound recording administrator (CD Baby), an indie label aggregator (FUGA), a publishing administrator (Songtrust), and a DSP royalty administrator (MediaNet, which is owned by SOCAN).[19]

B2C Applications: Music Ownership

Now we turn to B2C blockchain applications for music. The B2C application that is most discussed nowadays is distributing digital music to consumers with transaction records on a blockchain to establish both the provenance of the music and the personal ownership of each digital file.

To the extent that proponents of this blockchain application purport to solve a pain point for consumers, that pain point is the lack of true consumer ownership of digital files. Although a market for downloaded music files has existed for roughly two decades, consumers have never had the feeling that they owned those files as they did their collections of vinyl or CDs.

The market for digital music downloads began in the late 1990s. It initially bifurcated into authorized paid downloads with digital rights management (DRM) through iTunes and other retailers, and unauthorized free downloads shared through networks such as Napster and its progeny. There were also services that sold music downloads without

DRM, such as eMusic, but those constituted a small part of the market. Then the music industry eliminated DRM for paid downloaded files in 2009.[20]

More recently, interest in paid downloads has been declining. Music industry revenue from paid downloads peaked in 2012 and has been falling at an accelerating pace ever since. One reason for consumers' declining interest in downloads is that consumers have decided that downloads don't give them a sense of ownership of music and/or that ownership isn't important.

The industry's use and eventual abandonment of DRM is indicative of the lack of importance attached to ownership. There have been, of course, many arguments over DRM; the focus of many of them was on DRM's purported value in curbing copyright infringement versus its ability to restrict user actions that users expect to be able to do and which could be fair use, such as making copies for personal, noncommercial use on all of one's devices, or taking excerpts and using them in other works. Yet a somewhat different aspect of DRM is often overlooked: it was an attempt to emulate elements of physical media products in the digital domain, including user ownership of those products.

The idea was that if you had a digital file that could only play on your authorized devices, it was your file and no one else's; and you had some kind of guarantee that you got the file from a legitimate source. Although long forgotten today, some early vendors of DRM technology touted this idea of ownership emulation as a consumer benefit of DRM. As it turned out, consumers didn't recognize this value, and DRM proved to be limited in its ability to emulate ownership anyway. DRM didn't allow users to exercise first sale rights under § 109 (to resell, lend, or give away files), and it was ultimately a way to tie content to devices rather than people.

Moreover, the law doesn't recognize purchased downloads of digital media files as sales of copyrighted works; it recognizes them as transactions under licenses. This means that the license agreements that govern downloads – such as the Amazon Music Terms of Use[21] -- can specify whatever restrictions the publisher wants. Legal precedent says that if the rights that a user gets in a license agreement are more restrictive than those granted under copyright law, then the license terms are enforceable; see *Vernor v. Autodesk, Inc.,* 555 F. Supp. 2d 1164 (W.D. Wash. 2008).

So, DRM was an attempt to emulate physical ownership that failed; and then even doing away with DRM on music downloads did not result in digital products that consumers felt they "owned." Since 2012, the market has moved beyond downloads to streaming – a mode of delivery that does not purport to emulate ownership. More people are now interested in paying $10 per month for on-demand access to large catalogs of music (until they stop paying the $10 per month), or paying nothing for access to music with ads, than they are in paying $0.99 for digital tracks that they can play in perpetuity.

In this context, some people see blockchain technology as a way of truly emulating consumer content ownership in the digital domain.[22] There are variations on this idea, but the main concept is this: an artist creates a work. She sells unique digital copies of the work by distributing small files called *tokens*, which contain unique identifiers. The identifiers, and identifiers for the users who purchase the tokens, are stored on a blockchain, along with a timestamp denoting the time of purchase and other information. Each token denotes a user's ownership of the file.

If the user wants to alienate (sell, lend, rent, or give away) the file, there is a way to transfer ownership of the file by passing tokens from one user to another and adding new

records to the blockchain that establish the new ownership. This way, the blockchain always has a complete and permanent record of the chain of ownership of each file. This is shown in Figure 7: User A purchases a music track and then alienates it to User B by passing a token. Note that although one user can pass a token directly to another, a DSP is still necessary to distribute music files and process alienation as well as purchase transactions.

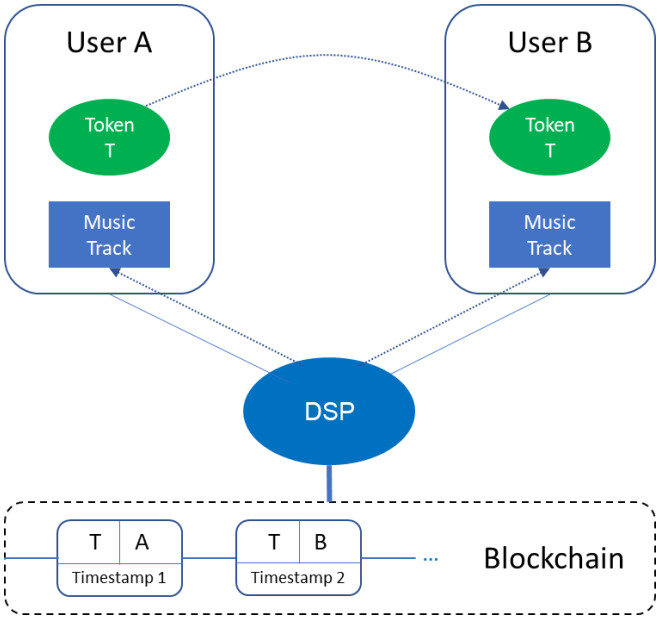

Figure 7: A blockchain-based digital music distribution system stores "ownership" enables users to alienate their music files by passing tokens to other users.

Variations on this scheme add the ability to ensure the authenticity of the file's contents by storing a hash value of the file's contents in the blockchain records.[23] A user can recalculate a file's hash value at any time and compare it to the hash value stored in the blockchain to ensure that the file is authentic.

This scheme could be worthwhile for visual (or audiovisual) artworks. In the art market, the provenance of art objects is very important, as is establishing that an artwork is not a forgery. There are well-known techniques in cryptography to ensure that the identity of each owner is also legitimate, such as digital certificates.[24] Therefore, a digital art market can exist that uses tokens and a blockchain to establish chains of ownership and requires possession of valid tokens as conditions of resale or other alienation of works. A few startup companies such as Verisart and Maecenas are building blockchain-based provenance and ownership tracking solutions for physical artworks; these could easily be extended to digital art, which is a market in its infancy today.

However, this scheme has scant potential in the digital music market. First, users have come to expect certain features of digital music that a system of tokens and hash values cannot support. Users expect to be able to make copies of files for playing on all their devices. All of the major paid music download services – including those of Apple, Google, and Amazon – have "cloud sync" features that automatically make copies of music files on

all of a user's registered devices. This is not compatible with the idea of changing ownership by alienating a single copy of the file, and there is no effective means of ensuring that if a user does this, all of her copies of the file (including backups and so on) are alienated.[25]

Users also expect to be able to make copies of music files that are not exact byte-for-byte copies for legitimate purposes, such as copies that are highly compressed (e.g., a lossless FLAC file compressed to much smaller MP3) or in a different codec (e.g., a Windows Media Audio (WMA) file transcoded to MP4-AAC for playback on Apple devices). The resulting files will not produce the same hash values as the originals and will thus be considered "inauthentic." This type of action is generally recognized as fair use in law when done for personal, non-commercial use; see for example *EMI v. MP3Tunes* [cite].

A technology called *acoustic fingerprinting* offers a partial solution to this problem: it is a complex variation on hashing that produces the same hash value for all files that sound the same, even if the bits and bytes are different. Acoustic fingerprinting is currently widely used for other applications, most notably detecting potentially unauthorized uploads to content-sharing services such as YouTube.[26]

However, acoustic fingerprinting does not solve the "authenticity" problem, because the notion of "forgery" is not very relevant in the music industry. Let's assume that "forgery" in music means "recorded cover version of a composition intended to pass as the original version." [27] Current advancements in audio content recognition technology are making it possible, in some cases, to detect cover versions of a given composition; even if this technique were to work very well, it would not be able to distinguish a properly licensed cover version that's meant to be faithful to the original from a "forgery." [28]

The second drawback of this type of B2C blockchain application for music is that consumers do not value ownership of digital music as they do physical music. The clearly ownership-free model of interactive streaming has rapidly become the most lucrative part of the recorded music industry – representing 47% of industry revenue – and is still growing fast, while paid downloads are at 15% of industry revenue and shrinking.[29] Ironically, the non-ownership characteristics of digital music has thrown the true ownership characteristics of physical products into sharp relief: vinyl LPs have been enjoying something of a renaissance since their mid-2000s nadir. Vinyl revenue is now back up to its late-1980s levels and rising,[30] but it's likely much higher than industry figures if used vinyl sales are included.

A related problem with the token scheme is that it does nothing to prevent unauthorized copying – which, regardless of whether such copying is copyright infringement, further undermines the concept of ownership. There is nothing preventing someone from making copies of a file and using them despite not being verifiable as the "owner"; there is also nothing preventing someone from appearing to alienate her files while actually keeping copies of them.[31] A requirement to check the user's identity, such as by digital certificate validation, would not prevent these contingencies unless it were part of a strong DRM scheme governing all uses of the files. But consumers would find strong DRM unacceptable, and it would still restrict users from doing things with their files that they would expect to be able to do, as explained above.

Finally, some proponents of blockchain-based consumer digital music distribution claim that it can enable musical artists to forge more direct relationships with their fans, because fans know that they are getting their music directly from the source.

This is unlikely. First, basic Internet technologies were supposed to do the same thing back in the 1990s – enable artists to eschew intermediaries and reach fans directly. Although artists have used Internet technologies such as social media to forge closer relationships with their fans, the same has not been true for actual music distribution. The intermediaries may have changed, but artists still need intermediaries to reach fans and still must contend with them to "rise above the noise."

Second, blockchains will never eliminate the need for service providers that sit between artists and consumers. Artists will need service providers – including some of the same types of service providers discussed in the B2B section above – to manage all of the functions required to distribute music to the public and collect applicable royalties. The service providers may well change, but they will still need to exist.

In all, the idea of using a blockchain to support direct consumer distribution of digital files is not promising, at least not in its current forms. It does not improve much on current paid-download schemes to create a true simulacrum of ownership for digital music, and the market has gravitated to distribution models for digital music that consumers like and that are not based on the idea of ownership.

Conclusion

Blockchain technology is still in a very early stage. The 2017 Gartner Hype Cycle for Emerging Technologies[32] indicates that hype around blockchain technology peaked between one and two years ago, is coming to the end of a "Peak of Inflated Expectations," and is 5 to 10 years away from mainstream adoption. Gartner predicts that blockchain will follow a well-trodden path of emerging technologies by falling into a "Trough of Disillusionment" before rising into a "Plateau of Productivity" a few years later. In other words, we're entering a period of backlash against all the blockchain hype.

Yet hype is valuable when it brings ingredients necessary for innovation, such as talent and funding. Blockchain technology has contributed to a resurgence of energy in the music industry after several years of decline and stagnation. Many startup companies have come into the music space with blockchain-based solutions; here's a partial list at this writing:

- Mediachain, Stem, Ujo Music, Jaak, and dotBlockchain have focused on rights and royalties management.
- Opus, TokenFM, Voise, Resonate, Choon, and PeerTracks are focusing on B2C music distribution.
- Other startups are using blockchain technology for music-related tasks like crowdfunding, venue licensing, and event ticketing.

In addition, Spotify is known to be working on blockchain-based rights management initiatives; it acquired Mediachain in 2017.

As with any new technology, there are bound to be many failed experiments before the worthwhile solutions emerge. We are not at that point yet, but an examination of current problems in the music industry should suggest where those solutions should come from. Yet the true measure of the technology's ubiquity will be its invisibility: we will know when it

has truly been incorporated into the music industry when the solutions are in widespread use, yet no one uses the term “blockchain” anymore.

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[1] Geoffrey Moore, *Crossing the Chasm, 3rd Edition: Marketing and Selling Disruptive Products to Mainstream Customers*. HarperCollins, 2014.

[2] http://coala.global/uploads/COALA-IP-Report-May-2016.pdf.

[3] Another important licensable music right is one that we will not discuss here and is not included in the “bundle” defined in § 106: the *synchronization* or *sync* right, which is often required for music that is included in a visual work such as a TV show, movie, music video, TV commercial, etc.

[4] It is possible for a songwriter to be affiliated with one PRO and to publish music through a publisher that is affiliated with a different PRO.

[5] For a much more comprehensive discussion of the U.S. music licensing “sausage factory,” see the U.S. Copyright Office report *Copyright and the Music Marketplace* at https://www.copyright.gov/policy/musiclicensingstudy/copyright-and-the-music-marketplace.pdf.

[6] Some recordings, such as “mashups,” can embody more than one composition; see note 13 below for an example.

[7] AFM (American Federation of Musicians) and SAG-AFTRA (Screen Actors Guild-American Federation of Television and Radio Artists) are labor unions that pay royalties to musicians and backing vocalists.

[8] The latter is only the case for digital radio services such as Pandora and Sirius XM, because otherwise there is no performance right on sound recordings in U.S. law. Almost all other countries have such a right in their copyright laws.

[9] See http://isrc.ifpi.org. The ISRC is administered by IFPI, the international umbrella trade organization for the recording industry.

[10] See http://www.iswc.org. The ISWC is administered by CISAC, the international umbrella trade organization for composers and their rights administrators, a separate organization from IFPI.

[11] See http://www.cisac.org/What-We-Do/Information-Services/IPI.

[12] See http://www.isni.org. ISNIs are used beyond the music world, such as for scholarly researchers and book authors.

[13] Note that this is potentially an M-to-N mapping. A composition can have multiple recordings (think “Yesterday” by Lennon & McCartney), or a recording can embody multiple compositions (think Danger Mouse’s *The Grey Album*, which contains mashups of the Beatles and Jay-Z).

[14] This is not just the case when the composition is old or obscure. There have been many cases of missing ISWCs for multi-songwriter compositions because of rules that require all songwriters and splits to be identified before an ISWC can be issued – resulting in hit records being released several months before ISWCs are assigned. More recently, those rules have changed and ISWCs can be assigned to compositions as long as at least one composer is identified.

[15] See https://copyrightandtechnology.com/2010/08/23/european-music-rights-database-project-issues-rfp/ for a skeptical view of the GRD at its outset and http://www.thembj.org/2015/08/grds-failure/ for a good summary of its failure.

[16] http://open-music.org/.

[17] http://www.nielsen.com/us/en/insights/reports/2018/us-music-mid-year-report-2018.html.
[18] http://www.comp.nus.edu.sg/~prateeks/papers/Bitcoin-scaling.pdf.
[19] https://www.prnewswire.com/news-releases/dotblockchain-music-project-announces-first-industry-partners-300400206.html.
[20] The industry still uses forms of DRM in most streaming services. See https://copyrightandtechnology.com/2017/02/16/the-myth-of-drm-free-music-revisited/.
[21] https://www.amazon.com/gp/help/customer/display.html?nodeId=201380010.
[22] See for example the COALA whitepaper, *supra* note 2.
[23] A hash value (or hash for short) is a mathematical shorthand for a large piece of data that represents the data almost uniquely as a numerical value. The hash value of a file is calculated by running a certain type of mathematical function on the file's contents to produce the hash value. With a well-designed hash function, two files with the same contents will produce the same hash value, while two files with different contents are highly likely (if not quite 100% certain) to produce different hash values. Hashes are widely used in a variety of authentication and data storage applications.
[24] A digital certificate is a piece of data that establishes the identity of a person or device, which is issued by a trusted entity called a *certificate authority*. It is somewhat analogous to a driver's license issued by a state Department of Motor Vehicles.
[25] See the U.S. Copyright Office's DMCA Section 104 Report of 2001 at https://www.copyright.gov/reports/studies/dmca/sec-104-report-vol-1.pdf. See also *Capitol Records Inc. v. MP3Tunes, LLC,* 07-CIV-9931a WHP (14 May 2013, S.D.N.Y.).
[26] See for example *Viacom v. Google* and *Universal Music Group v. Veoh*.
[27] There have been cases of recording artists exploiting the statutory mechanical license to create cover versions of hit songs for mildly deceptive purposes. In the 1970s, companies such as K-Tel sold albums of then-current hits performed by cover bands rather than the original artists. More recently, when major pop stars hold material back from streaming services, artists create cover versions and release them on those services so that users who search for the songs find and play the covers. This is far less consequential in the market than, say, a painting claimed to be a Vermeer selling for tens of millions of dollars and turning out to be a forgery.
[28] For example, Todd Rundgren's 1976 *Faithful* album contained licensed covers of 60s pop tunes that were intended to be as close to the originals as possible.
[29] RIAA figures for 2017. Interactive streaming figures include Paid Subscriptions and Limited Tier Paid Subscriptions.
[30] 2017 RIAA figures attribute 5% of recorded music revenue to vinyl, up from near zero in 2006.
[31] See *supra* note 25.
[32] https://www.gartner.com/newsroom/id/3784363.